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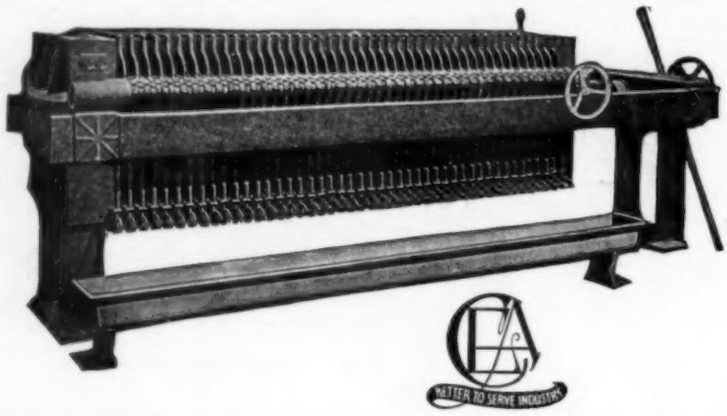

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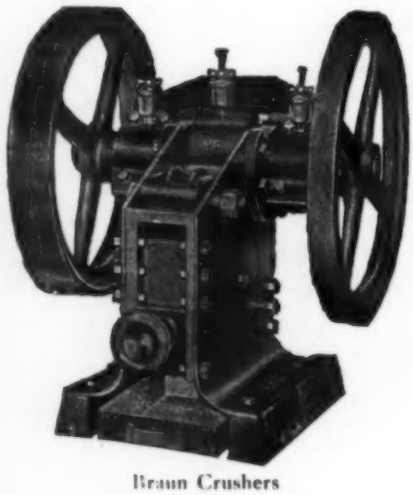

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Judge Gary's Optimistic Outlook

IN A recent address as president of the American Iron and Steel Institute, Judge Gary sounded a note of business optimism for the United States that should be relayed to the four corners of the land and taken to heart by those who are inclined to see through a glass darkly. These annual speeches by Judge Gary have come to be regarded as beacons to business, coming from one who speaks with authority. And it may well be so. He is the titular head of one of the great basic industries of this country. In the industrial census of 1919 iron and steel ranked first in value added by manufacture and second each in total value of product and number of wage earners employed. In Judge Gary's own words, "We have a productive annual capacity of about sixty million tons of steel. We employ a maximum of about six hundred thousand men, who with their families aggregate a population of two and a half million people. We transact a business of two billion dollars or more annually." Obviously a business of this magnitude is of vast importance in the industrial life of this country and its leader bears a responsibility of which he is no doubt fully aware when he makes a public utterance.

Fully sensible of the social, economic and political turmoil in which the world is involved and further realizing that "the great seas are not wide enough to separate us from the influence of disaster in Europe," Judge Gary nevertheless feels that "we may be independent of all other countries so far as business progress and prosperity are concerned." The national resources of the country and the ability and acumen of our business leaders form a combination on which we can predicate continued prosperity if we are not distracted by occasional interruptions and setbacks. Viewed in its proper perspective, free from the distortion of minor details, Judge Gary finds "that the current of prosperity in the United States is so strong that even though it may be occasionally modified by unnatural or unreasonable obstructions, this will result in accumulation of volume and force which will soon be overwhelming and stronger than ever before."

Not the least important element in Judge Gary's picture of our national prosperity is the background he paints of the relation of government to business. The farther we get away from our war experience, with its control of business by the government, the more certain we want to feel that political experiment or expedient shall not characterize the government's attitude toward business. Evidently Judge Gary is not worried about the stability and sanity of the present administration, for, without political bias and from a simple analysis of the character, utterances and past performances of the President, he finds "no reason to fear there will be a serious financial or commercial disturbance or depression during the next few months." But in reaching this conclusion he charges business with the necessity of conducting its affairs with the high ideals that animate the Chief Executive in the performance of his duties.

Judge Gary's analysis and hopeful outlook should have a tonic effect on industry in this country. And it will be strengthened by the favorable international developments of the last few days. With stability and prosperity at home, supported by the prospect of an early settlement in Europe, industry will be able to join in the steel leader's conclusion: "It may be stated with confidence that the outlook is good."

Ethics For Chemists

IN PROPOSING a code of ethics for the guidance of chemists, the American Institute of Chemists has taken the first step in formulating the ideals of the profession. Of the timeliness of this move there can be no question, for codes of professional ethics and standards of business practice are distinctly the order of the day. Nor are chemists any less in need of them than are other groups of men of earlier origin and equally honorable estate. If the reader is in doubt of the extent to which the professions and branches of business have given attention to ethics, he is referred to the *Annals* of the American Academy of Political and Social Science for May, 1922, in which 236 pages are devoted to the subject.

As professional men of specialized ability and a high degree of skill in the practice of industrial arts, chemists bear a relation to the public welfare that is not incumbent on, say, bookkeepers and clerks. The definition of this obligation to the general good of society and the maintenance among professional men of a lively sense of that obligation is the function of ethics. It is the ideal of service that is sought to be expressed, the rule of conduct of one member toward another and of the whole profession toward society.

In the particular code proposed for the American Institute of Chemists the customary tenets of professional honor, integrity and fidelity in all transactions are strongly expressed. The chemist is to protect the public from the use of his good name by the charlatan or promoter of questionable repute. He is to be far above accepting a tip or bribe even when that insidious gift appears in the disguise of a "commission." He is to recognize his obligation to the profession of which he is a part and contribute of his time and knowledge to its upbuilding. And finally comes that obligation to

devote himself to the public welfare and apply himself in part to the betterment of his fellows in society.

The idea of a code of ethics for chemists meets with our hearty approval. It should prove an excellent agency for developing solidarity as well as integrity in the profession. We have laws aplenty to curb illegal acts on the part of chemists as well as all other members of society, but we have as yet no clearly defined and accepted agency for raising us above the mere observance of law or abstinence from crime. This is the function of ethics—the expression and practice of those ideals of service that transcend the making of a living by a law-abiding citizen. In securing an acceptance by chemists of such a code of ethics the American Institute of Chemists will be rendering a signal service to the profession.

Industrial Waste Disposal, A Chemical Engineering Problem

IN MANY, if not all, of our more congested industrial centers, the problem of waste disposal is one of serious moment. Natural dilution in open streams, a method which passed unnoticed in less crowded times and was tolerated for patriotic reasons during the war, is no longer immune from criticism and censorship by city, state and federal governments. At the conference on Industrial Waste Pollution held in Philadelphia on Oct. 16 the sanitary engineers pointed out that in more instances than one the chemical engineering industries were among the more flagrant offenders in this connection. This is but natural, of course, for our disposal problems are as complicated as they are diversified. Yet it is gratifying to know that from many directions progress is being made toward the solution of these problems.

At Newark, N. J., that capital of chemical industry and center of chemical engineering production, the Passaic River has long been an eyesore, a smelly, dirty menace to health and a blight to riparian property. The wastes of the many adjacent chemical plants, of the leather tanneries and of the textile mills of Paterson and Passaic that discharge their spent dye liquors into the river have combined to give the stream the appearance of an open sewer, a patent public nuisance. Now, by the expenditure of $20,000,000, the Passaic Valley Sewerage Commission is about to complete a great trunk sewer to carry the wastes far out into New York Bay. The next step in the project will be to clean up the river itself and those plants the industrial wastes of which cannot be cared for by the new construction will be forced to install adequate methods of treatment.

A point brought out in the Philadelphia conference that is sometimes overlooked by our industries is the tremendous effect that even a few plants may have on the character of a stream. At Akron, Ohio, for instance, there are three rubber reclaiming plants which together discharge 117 lb. of solid wastes for every 100 lb. contributed by the city sewage. The same condition, perhaps to even a more exaggerated extent, obtained at Chicago when the organic wastes of the stockyards were permitted to pass untreated into the well-named Bubbly Creek. Milwaukee's famous "river of ink" drew much of its contamination from the adjacent byproduct coking and coal-tar industries. Here an interesting complication arose from the fact that the phenol in the wastes carried into Lake Michigan by the Milwaukee River was in sufficient quantities to form malodorus, ill-tasting chlorphenols when the lake water was chlorinated for municipal use. It was reported that in another city 1,700 ft. of a concrete sewer was ruined within 3 weeks by the heavy acid wastes discharged by an industrial plant. It was estimated that this single incident alone necessitated the expenditure of $70,000 to repair this stretch of sewer.

Many of the chemical engineering industries, however, have been conspicuously successful in solving the difficult problems of waste disposal. On the Neponset River, for example, just out of Boston, two paper mills, a tannery and a wool-scouring plant have been able to treat industrial wastes of far greater complexity than ever attempted in a municipal disposal plant. At Olean, N. Y., a refinery of the Standard Oil Co. is reported to have installed a plant for treating oil wastes that not only prevents stream pollution but is actually being operated at a profit.

Other examples could be adduced without effort to show that our executives are alive to the seriousness of these problems and are co-operating with those who are charged with the regulation and control of stream pollution. Were we permitted to sound a note of warning, however, it would be addressed both to industry and to government. The former must recognize the existence and inherent rights of Mr. Private Citizen. The patience of that individual is at times sorely tried and it is his right to complain when conditions grow intolerable. On the other hand, the government, whether local or national, must appreciate the serious handicap that ill-advised legislation may impose on industry. The rule of reason must be invoked in order that enforcement of its regulations will not cripple or nullify the efforts of the conscientious chemical manufacturer who is doing all in his power to solve his extremely complex problem of waste disposal.

The Importance Of Fluid Flow

CHEMICAL engineering practice is based upon certain fundamental mechanical and physical operations—the so-called unit processes. Most basic of all these processes is that concerned with the movement of materials from one place to another—material handling. And of the classifications into which material handling may be divided, that of most importance to the chemical engineer is flow of fluids—liquids and gases.

The apparatus of fluid flow—fan, blower, pump and pipe line—are the familiar tools of all who are engaged in production work in the chemical engineering industries. But familiar as these are, there still are many things relative to their proper selection and operation either unknown or unheeded by most engineers. For this reason anything that will insure a better treatment of the problems of fluid flow is a real help toward better plant conditions.

These remarks apply particularly to the design of pipe lines. The correct proportioning and layout of pipe lines may well spell the difference between profitable and unprofitable operation. To make this design correct and realize the greatest economy of operation involves much complicated and difficult engineering. Not the least difficult thing is to arrive at the correct pipe pro-

portions. This involves six variables. Only two of these, pressure drop and length of line, are easy to determine. The four remaining have always involved the use of the trial and error method, which is difficult, confusing and lengthy. Because this is so, the short-cut suggested in the paper by Barnett Dodge, published in this issue, should help engineers in the solution of their problems of fluid flow and hence raise the general standard of engineering in this important unit process.

Unsolved Problems in Sulphite Pulp Production

IN its essential characteristics the sulphite pulp industry does not differ markedly from others in which recent development has been rapid. In the scant 50 years of its industrial existence the sulphite process has assumed such importance that it may be said to underlie the entire pulp and paper industry of the United States. During this period of development empirical technique has forged ahead relatively much more rapidly than has our knowledge of the fundamental principles governing the process. Although much research has been carried on and more is in progress in our effort to solve the mystery of the constitution of cellulose, for instance, still such investigation has been unable to close the gap between the science and the art of production. Apparently we are fast approaching the point where if we are to continue to build up the technology of production we must have more fundamental knowledge—we must know cellulose and lignin substances better. This, then, must be the major objective of the technical man in the industry, of the chemical engineer who has already contributed largely to the solution of such difficult problems as efficient sulphite acid production and construction of a satisfactory acid-proof digester.

A fresh significance of the magnitude of sulphite pulp operations may be gathered from the fact that 1,200,000 cords of wood is used annually for the production of approximately 600,000 tons of air-dry pulp and an even greater tonnage of calcium-lignin-sulphite compounds, the latter item being commonly regarded as a dead loss, since no feasible process exists for its commercial utilization. Of the sulphite acid used in digestion, barely 25 per cent is recoverable as such. The spent sulphite liquor in itself, to say nothing of the lignin content associated with it, represents an immense item of loss, since in American practice from 200 to 350 lb. of sulphur is used per ton of pulp produced. Improved production, from the standpoint of both quantity and quality of pulp, hinges upon the same fundamental knowledge that will make possible the reworking of the sulphite liquor to yield commercially valuable products.

Aside from these more or less indirect losses of by-products, there is the problem of heat to be considered. It costs roughly $6 to steam a ton of pulp. This steam is drawn quickly from the boiler house, creating a sudden and heavy load and calling for excessive capacity not required at other times. Another serious phase of the problem is that steam coming from the digesters during and after the cook is usually lost in practice. Methods now being developed to overcome this may point the way to the solution of this particular problem, but it is still certain that there is work for the chemical engineer in increasing the heat efficiency of the process.

It should not be gathered from this brief résumé that the industry is unappreciative of these problems which we are pointing out. Although producing a high grade of pulp and that at a profit, it is not content with its present methods. These problems are being earnestly attacked in many quarters—notably in such organizations as the Forest Products Laboratory, where a great work is being carried on in fundamental cellulose research. It is the sort of knowledge made available by this institution that is most needed. If the sulphite industry is to progress, there can be no alternative; we must have the facts.

Humor and Good Literature In Popularizing Technology

OCCASIONALLY the thought obtrudes itself that as a nation we are very much in earnest in our life's work. Our convictions are so weighty that we sometimes allow them to oppress us. And then there is danger of depressing others because of the methods customarily used to convince and to educate.

The saving grace of humor has merits that need no emphasis. The droll or the witty may save a difficult situation, deflect unpleasantness and aid in the restoration of good nature. Or it may relieve the jaded intellect long enough to enable us to return to our tasks in a spirit of optimism. But, one will ask, how can humor be injected successfully into the description of a mechanical process, in which pains have been taken to eliminate so far as possible the human element? From across the "pond" comes an example of how this may be done, in describing modern methods of handling material. An enterprising corporation, the Port of Manchester Warehouses, Ltd., the chairman of which is Marshall Stevens, has issued an attractive booklet to familiarize the general public with the improvements in mechanical methods introduced in its plants. Striking contrast is afforded by the reproduction of actual photographs of modern equipment alongside farcical drawings of prehistoric scenes, from the pen of W. Heath Robinson, one of England's leading humorous artists. The descriptive matter is excellently written, evidently by an experienced journalist. The opening paragraph is worth quoting:

> There is a quality in men and things which is briefly defined in a popular phrase as that of "staying put." In some men and things it is an obvious and fundamental virtue; it is as well, for instance, to have sentries and lighthouses which can be relied upon to "stay put." But in the case of merchandise this particular quality is hardly ever a virtue. This is a pity, for the common characteristic of the great family of the bale, the case, the sack and the cask is an infinite capacity for repose. They will hang about with the best—but the trouble is that they are perfectly content to hang about where they are not wanted. Like the æsthete in the *Punch* drawing, the real ambition of the 5-cwt. bale of cotton is just to exist beautifully. With a sigh of infinite relief it settles down to this ambition at the bottom of a ship's hold; swung clear of this dreamland and deposited in a railway truck, the same overwhelming lassitude asserts itself. Deep in its compressed being it nurses two unconquerable hopes—to do nothing, and to do it in a place that is urgently wanted for some other member of the family.

It is obvious, therefore, that this industrial corporation has an ideal in advertising—the best that money can buy—even to the extent of engaging an artist of international reputation and an experienced journalist to inject some humor into what otherwise would be an unattractive technical dissertation. And the cost to the corporation? The booklet is *sold* at one shilling per copy! And it is worth the money. *Verbum sap.*

Is "Bankrupt Europe" Headed for Disaster?

Business Men Who Know Exports Do Not Think So! Why, Then, Should We Think So?

SEVERAL weeks ago at the National Conference of Business Paper Editors held in Chicago a note of optimism was sounded that is decidedly worth our serious consideration. Franklin Johnston of the *American Exporter* presented some cold statistics that put to rout the scareheads to which we are treated in the daily press to the effect that "Europe Is Bankrupt" and in which such words as "Chaos," "Abyss," "Upheaval," appear with almost tiresome redundancy. Mr. Johnston shows conclusively that not only is Europe not unable to purchase foreign products but that she is purchasing them and *paying* for them.

"Last summer the sensational drop in the price of wheat was blamed on Europe's inability to buy our foodstuffs because of impending bankruptcy. As a matter of fact the reverse is true. The reduced demand for wheat was due to increase in Europe's own supply. Russia is exporting wheat, whereas a year ago she was being fed by American relief committees. France will import no more wheat and other sections are far ahead of last year."

"Conditions in Europe are undeniably bad, but they are improving and she is buying and paying for a billion and a half dollars worth of foodstuffs a year—over half of our exports and from six to fifteen times as much as prewar."

Mr. Johnston recalls that the opinions of the prominent Americans who visited Great Britain last summer all contained the depressing comment that there were 1,500,000 unemployed, but failed to mention that this number was less than the same figure last year and that despite war losses there are 1,500,000 more people in Great Britain than in 1914. Her exports, reduced to pre-war prices, are only 10 per cent less than before the war and her imports 2¼ per cent less. And in France there is no unemployment and the exports are substantially what they were last year in spite of the dire predictions when the Ruhr was occupied.

Below the scareheads in the daily press about Europe's disintegration you will find in nine cases out of ten that the prediction comes not from business men but from politicians—usually out of office. Business men dealing with Europe—and getting their money—talk differently, but their voices do not reach the public.

"Russia's return to activity is evident in many ways—exports of raw materials (which, by the way, may have a detrimental effect on American exports of certain kinds), a tremendous commercial mission in Berlin, employing 600 people, engaged in buying and selling. And every other country in Europe shows increased foreign trade, decreased unemployment and other signs that are certainly not characteristic of a débâcle. Even Greece, with all her troubles, has bought from us eleven times the amount she did in 1914."

"A number of industries offer typical encouragement—such as the automobile, where we export four cars to one in 1913. Exports of automobile accessories are eight and one-half times those of 1913 and lest these be taken as too favorable examples, on a basis of 1919, that abnormal emergency year, July was 81 per cent and August 75 per cent of the 1919 level. Our exports today are 60 per cent greater than those of any pre-war year and at 1913 prices would still show slight increases. Our foreign trade is well balanced and our customers are paying their way."

In this connection there is another interesting angle. Our market editors were a trifle skeptical about the truth of the above generalization in our fields of interest. But after carefully checking up they were amazed to find a healthy and in some cases a startling increase in the exports of such commodities as chemicals, naval stores, soap, oil cake, rubber goods, cotton manufactures, paper, petroleum, crude and refined; glass, soap, etc., in 1923 over 1922.

One thing more, as Mr. Johnston pointed out in his paper, Europe is the dominating factor in world trade conditions. A discussion of the European situation involves our own partisan politics, prejudices, emotions, propaganda and special pleading. It is, at best, controversial, but remember the evidence that Mr. Johnston has marshaled and do not shudder the next time some one politically minded gasps out, "Europe is doomed!" You can't buy and pay for a billion and a half dollars worth of goods and be progressing inexorably to perdition and general débâcle.

Chemical Engineering in

The Production of Book Paper

A Study of the Newton Falls Paper Co., Newton Falls, N. Y., Where McGraw-Hill Paper Is Produced

This First Article Surveys the Technology of the Process and Develops in Detail the Preparation of the Wood, the Making of Sulphite Acid and the Digestion and Refining of Pulp

BY HAROLD J. PAYNE
Of the Editorial Staff of *Chem. & Met.*

THE paper and pulp industry is becoming recognized to a constantly increasing extent as being based upon the fundamental principles of chemical engineering. Naturally with several distinct methods in common usage for the production of pulp and with a myriad of finished products, these industries vary in exact nature of the application which they make of these fundamental principles. The plant of the Newton Falls Paper Co., to be described in this article, turns out about 45 tons of paper per day, largely book paper, in addition to some sulphite bond and ledger. The major product is book paper similar to that upon which this magazine is printed (this was actually produced there). Sulphite pulp is produced from spruce and hemlock logs, de-inked stock is turned out from old magazines and these materials are in turn fabricated into the finished sheet. The bleaching system in use in this mill is unique in that it has been the first in the United States to employ the "dry bleach" principle whereby the pulp is whitened at much higher consistency than has been considered practicable in the past. Since operating figures are available upon this interesting installation, more emphasis will be laid upon this step in the process than the older and fairly well-standardized procedures of pulp and paper manufacture.

About 130 mills are producing sulphite pulp in this country. Although the technique employed in no two mills is identical, still the underlying principles and basic operations are common to all. Also in our paper mills, procedure seldom varies as far as the manner of carrying out fundamentals is concerned, and throughout these plants we find chemical engineering processes at the root of production.

The industry is in a class with many others in which the application of chemical engineering principles is just becoming recognized, one in which the technology

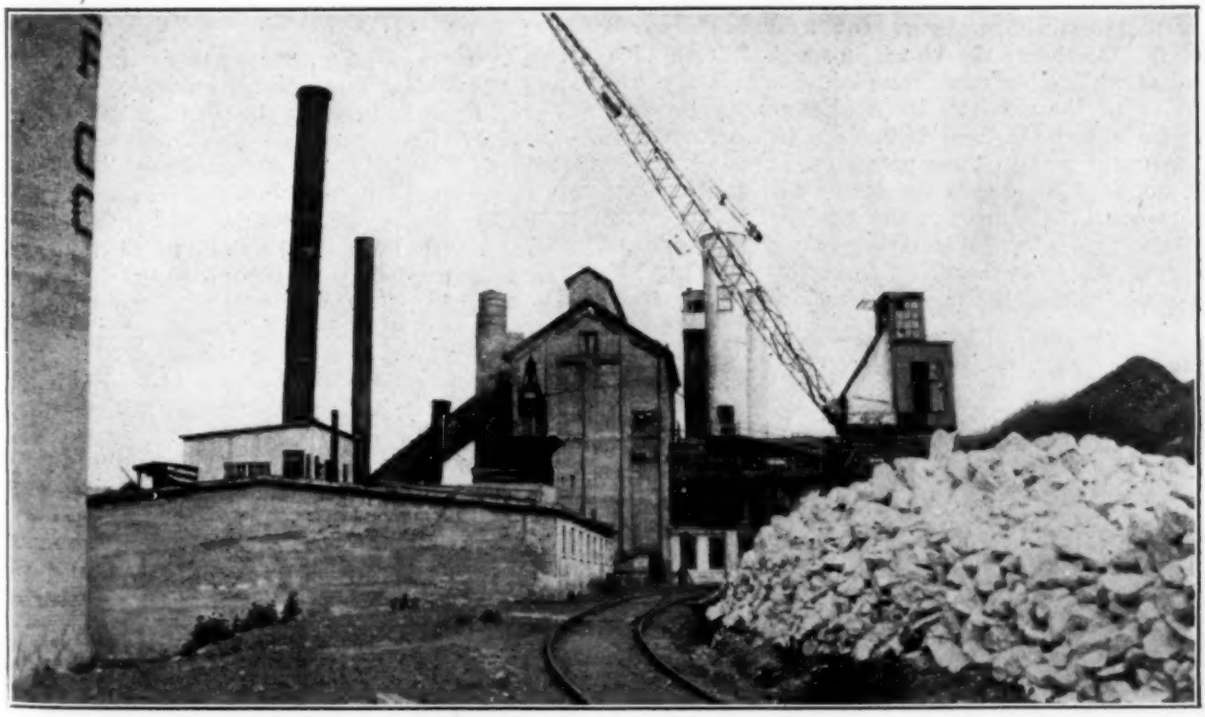


FIG. 1—NEWTON FALLS PAPER CO. PLANT

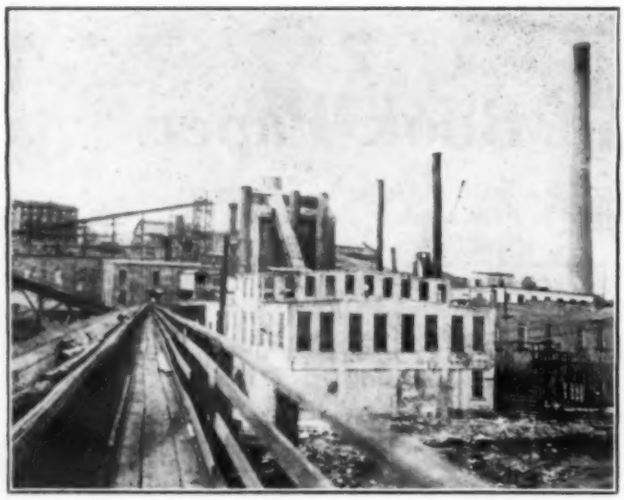


FIG. 2—LOGS GOING TO MILL FROM RIVER

is decidedly in advance of the available information regarding fundamental relations. Likewise it is one in which much of the equipment employed is highly specialized in nature. However, it is mainly by the analysis of the operations conducted in such equipment that applications to other industrial processes may be derived.

It must be made clear that at this mill two distinct processes are employed in pulp production. Both begin with mechanical disintegration—of wood for the new pulp and of the paper for de-inked stock. Chemical disintegration takes place during the digestion of the wood chips; to a less extent in the bleaching tanks. Mixing and disintegration are especially interesting in the beaters, where the ingredients of the finished sheet are brought together. Mechanical separation in the dry state is carried out in the screens controlling the size of the chips; the same separation in the wet state is conducted in knotters, various rotary screens, riffles and diaphragm screens. The pulp is thoroughly washed as blown from the digesters and again as dropped from the bleachers; the bleach liquor is filtered in a sand bed, while other solids from liquids separations are made as in the save-alls by simple gravity settling. Likewise absorption, heat technology and drying play an important part in these processes.

In the sulphite process the spruce and hemlock logs pass through the chipper to the digester and bleaching system to the beater and so through the plant. De-inked stock, on the other hand, is made by shredding old magazines, boiling, beating and bleaching in a separate

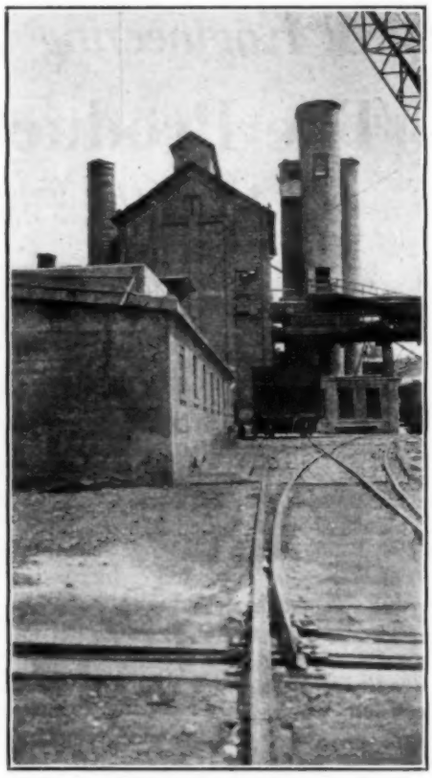


FIG. 5—DIGESTER HOUSE—JENSSEN ACID SYSTEM

system, thence through the plant with the sulphite pulp, the two materials being brought together in the beater. Economically the production of pulp from logs is deemed more advisable in an isolated plant, where freight rates are high to the source of the old paper stock and to the market in which the finished product is sold. For that reason, considerably more pulp is produced by the sulphite process than by the de-inking process at Newton Falls.

Sulphite Pulp Production

The usual back door entrance to a pulp mill is at the river. This plant furnishes no exception. The cooking process in this mill, where the output of three digesters averages 30 tons of pulp per day, does not differ essentially from that generally employed wherever this method of converting wood into chemical pulp is used. It is interesting to note at the start that river logs require about 36 hours for conversion into finished pulp at this plant and that from 1.8 cords of wood 1 ton of air-dry pulp is produced. Approximately 18 man-hours is nec-

FIG. 3—BUILDING UP LOGS FOR WINTER USE

FIG. 4—STORAGE PILES OF SPRUCE AND HEMLOCK

essary for this production of 1 ton of air-dry (90 per cent fiber) pulp. These figures compare favorably with usual practice, where about 2 cords of wood and 20 to 22 man-hours are required for the same unit production.

Up to the chipper in the wood room the process is largely mechanical or manual. The logs, mostly already barked as they come from the river, where several years' supply is afloat, are carried by a lug-and-cable conveyor to a slashing table, where their length is reduced from 16 to 4 ft. From this point an endless conveyor of the same sort (left of Fig. 2) carries them either to the storage pile which constitutes the winter supply (Figs. 3 and 4) or direct to the "sorting table," where oversize logs or logs badly in need of barking are bypassed to a splitter or to a rotary disk barker. Less care is given in removing knots, rot and small pieces of bark than is necessary in obtaining a clean sheet where any of the ordinary bleaching systems are employed. The first step in sulphite pulp manufacture is to render the lignin-cellulose compounds of the log into a form from which the lignin may be removed. For this reason they are chipped. This process is very essential to successful production, since the penetration of the acid to be used in digestion depends on the exposed cross-section of the fibers.

The chipper consists of a very heavy steel disk about 8 ft. in diameter, carrying knives set against its face at an angle suitable for cleanly shearing the wood. The logs are fed against this revolving disk at an angle of about 45 degrees with the result that a mechanical disintegration takes place, leaving the logs largely in the form of slices slightly less than an inch thick. These slices drop into a crusher, which further disintegrates them to chip form, roughly $\frac{7}{8}$ in. square and $\frac{1}{2}$ to $\frac{3}{4}$ in. thick. To insure uniformity these chips are sized on a set of shaker screens adjusted at a slight angle off horizontal and which have both a forward and downward reciprocating motion. Oversize chips return to a hog, a sort of rechipper, which reduces their size and returns them to the screen. The fines, slivers, sawdust, etc., are fed to a waste fuel boiler. From the screens the acceptable chips, ordinarily carrying from 30 to 40 per cent moisture in summer, are carried to a bin system above the digesters. These bins are actually above everything else in the plant with the possible exception of the Jenssen towers in which the sulphite acid is made with which the chips are to be cooked. The chips are now ready for cooking with the sulphite liquor, which is made in the following way.

Operation of the Acid-Making System

The chemical engineering involved here is fundamentally an absorption problem. A secondary problem appears in the necessary combustion of sulphur to form a gas of satisfactory composition. Sulphur dioxide flows counter-current to a stream of water flowing over natural limestone, with which towers are packed, thus forming acid calcium bisulphite liquor. These absorption towers are of identical reinforced concrete construction approximately 50 ft. high and 9 ft. in inside diameter. The lower 20 ft. of space in each is filled with wooden grating. An elevator for carrying up the limestone employed is shown in Fig. 5 between the two absorption towers.

Sulphur is burned in a rotary burner at a temperature and with an excess of air that will produce a minimum of sulphur trioxide while at the same time a maximum of sulphur dioxide is produced. A temperature of 1,300 to 1,400 deg. F. is employed. A recording pyrometer is used for control at this point. It is essential

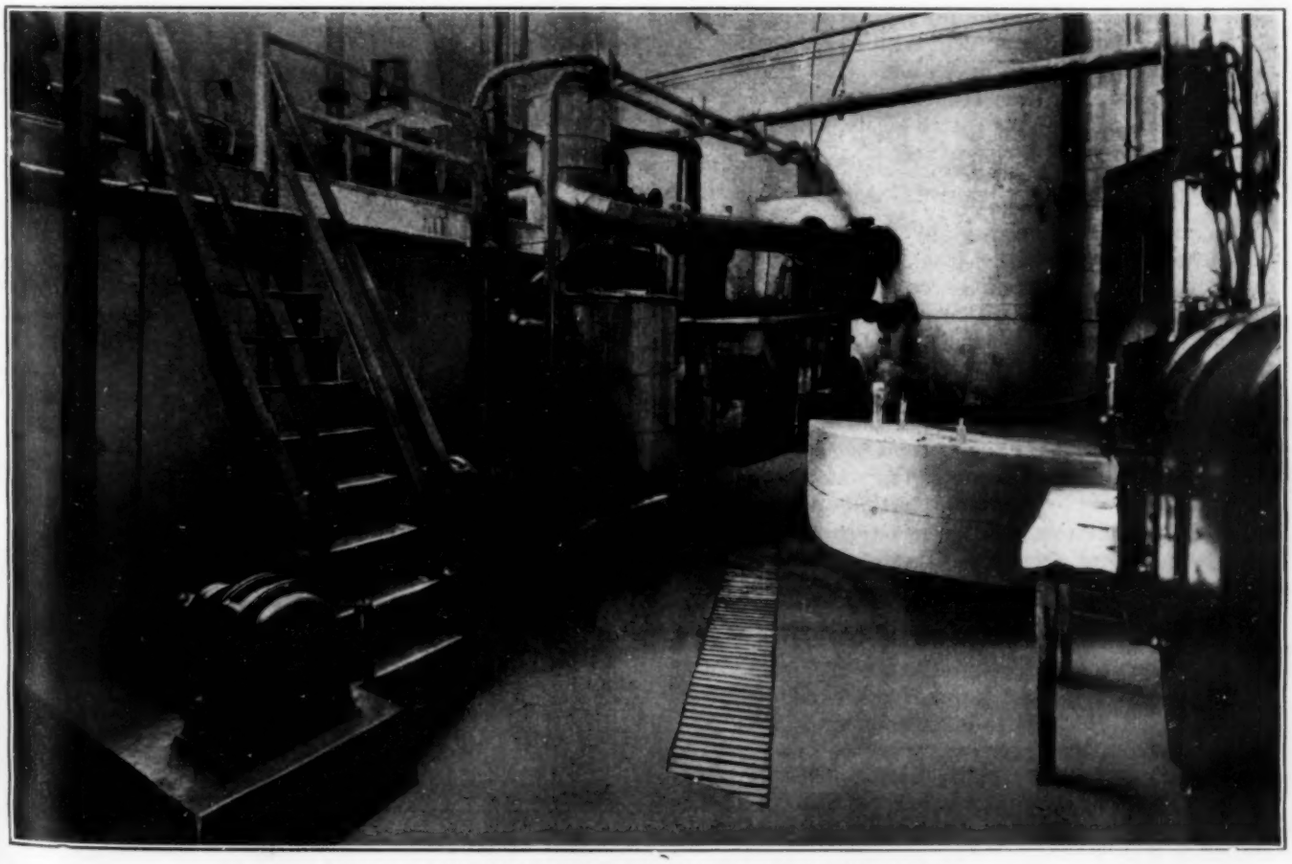


FIG. 6—ACID ROOM SHOWING FANS AND TOWER BASES

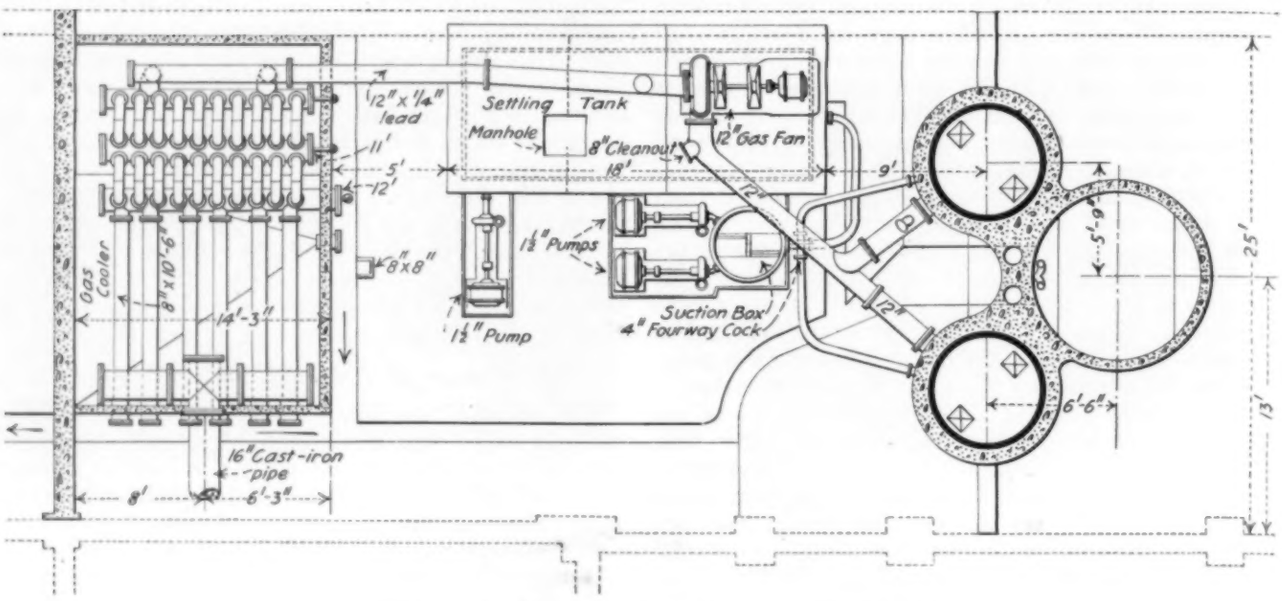


FIG. 7—PLAN VIEW, COOLERS, FANS AND TOWERS

that conditions be so maintained that the combustion of S to SO_2 will be complete without the formation of appreciable quantities of SO_3 and that the quality of the gas coming off be kept reasonably constant in composition. To fulfill this latter requirement the sulphur is fed at a constant rate by means of a worm screw. Having produced the sulphur dioxide, in a mixture carrying around 16 per cent of this gas under normal operation, it is necessary to cool it, partly to insure against combustion to sulphur trioxide and partly to keep the temperature in the towers low enough to bring about the formation of an acid with a composition most suitable for the cooking operation. Once the temperature of the gas has been reduced below 600 deg. F. no further danger of SO_3 formation exists, since the critical range lies above this temperature.

Cooling the Gas

The cooling is carried out by running the gas from the burner through a cast-iron header, first into horizontal coolers submerged in running water, then up into a series of vertical coolers with headers at top and bottom. Cold water is constantly being sprayed over these vertical coolers. In the bottom headers, taps are arranged with water seals to remove any sulphur trioxide present condensed in the form of sulphuric acid. In normal practice the gas leaves this system cooled very close to the temperature of the water. Incidentally the heat absorbed by the water in this operation is used to advantage in the subsequent washing of the pulp when it is blown from the digesters. A view of the acid room showing the fans and control apparatus is shown in Fig. 6.

The gases, drawn through the cooler by suction, are forced by the same fan into the foot of one of the towers, called the "strong acid tower," under slight pressure (1½ in. H_2O). Here there is an addition of gas coming indirectly from the digesters, which enters on the vacuum side to join the freshly formed SO_2. It is to be noted that these towers are alternated once in 24 hours. The layout of the towers and auxiliary apparatus is shown in Fig. 7.

The gas passing into the foot of the strong tower meets a fairly strong acid which has been formed partly in the "weak acid tower" and which at this point is finishing its passage down through the strong tower. In the space below the lime there is a tendency to form "free" acid or straight sulphurous, while in the tower itself, in the presence of the limestone, the tendency is stronger to form the calcium salt (bisulphite) or "combined" acid. Incidentally any SO_2 which has got through will react here to form the relatively insoluble calcium sulphate ($CaSO_4$), thus keeping up the efficiency of absorption on the stone.

The temperatures and quantities of liquor and of gas are the chief factors in determining the nature of the acid produced providing the quality of limestone and of gas are carefully maintained close to constant. With 22.2 per cent SO_2 (a mixture of excess from recovery plus that by direct combustion) gas at 90 deg. F., with water at 72 deg., with a high-calcium lime (about 97 per cent $CaCO_3$), an acid carrying a total of 4.75 per cent of sulphurous acid was produced. Of this, 2.76 per cent existed as such or "free," while 1.99 per cent existed in the form of calcium bisulphite or "combined." To insure uniformity of this product a tower man analyzes the liquor at frequent intervals, governing the

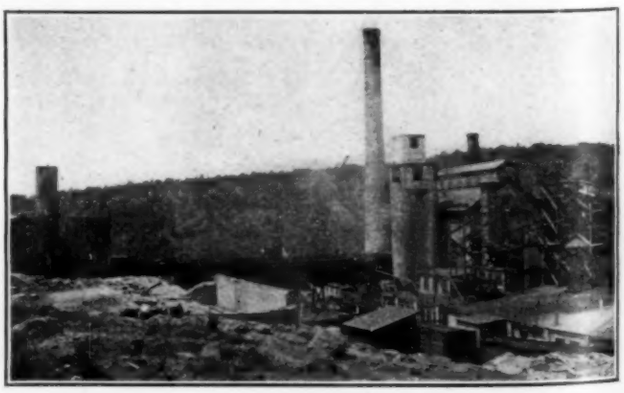


FIG. 8—GENERAL VIEW SHOWING RECOVERY TANKS ON LEFT

operation of the burner to keep up the strength of the gas, and the temperature and volume of water to give the correct ratio between free and combined acid.

The gas as it emerges from the top of the strong tower still carries 10 per cent of the original SO_2 or less. This is conducted to the base of the weak acid tower, and is allowed to pass up while fresh water flows down. In this way the last of the sulphur dioxide is removed. At the top of this tower the carbon dioxide, nitrogen and oxygen are released to the atmosphere. The acid from this tower is pumped to the top of the strong tower.

The principle of absorption involved here is that of counter-current washing, letting the strong gases (high in content absorbable) come in contact, first with a solvent carrying some of the solute, then with a solvent carrying none. The acid is strengthened to the maximum by being brought in contact with fresh strong gas as it leaves the strong tower, while the last of the gas is absorbed by the fresh water in passing out of the weak acid tower. Partial pressure of the SO_2 in the acid and gas at various points in the towers determines the product. In Europe much more study has been given these factors than in this country.

The limestone is gradually dissolved by the action of the acid. It is to be remembered that the stone itself is supported in the tower on top of about 20 ft. of wooden cross-timbers, underlaid by a wooden checkerwork. Each day the tower acting as the weak tower is opened up and filled with fresh stone. For a normal day's operation a makeup of roughly 9,000 lb. is necessary. In the same period about 7,500 lb. of sulphur is burned.

From the bottom of the strong tower the acid is pumped to a settling tank before being pumped to one of a series of tanks which act both as storage and as a recovery system for the acid gases formed during the process of digestion of the wood chips. The raw acid as it enters the recovery system is considerably weaker than it is on leaving, due to the addition of acid gases rich in SO_2 coming from the digesters which cook the pulp.

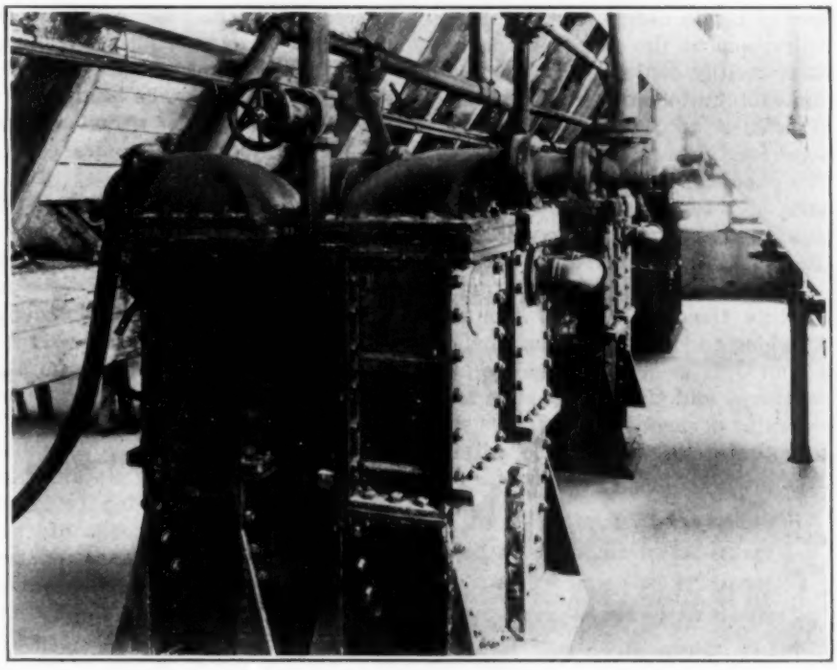


FIG. 9—COOLERS IN RELIEF SYSTEM—OVER DIGESTERS

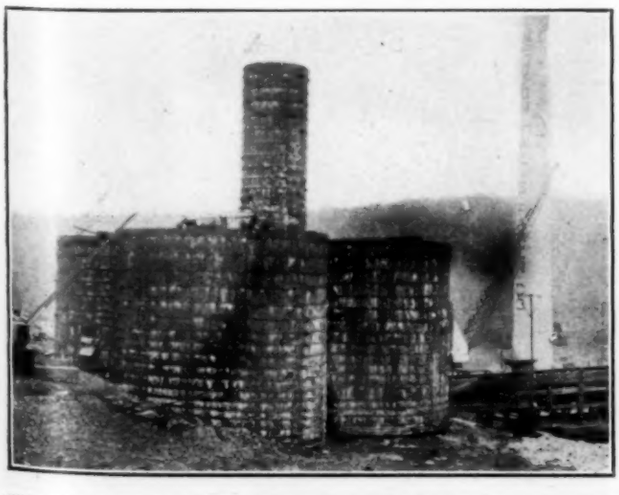


FIG. 10—TANKS USED FOR ACID STORAGE AND RECOVERY

Digestion of the Chips

The digester as employed is perhaps too well known a type of equipment to be described in detail. It consists essentially of a vertical cylindrical shell with conical-shaped base and dome-shaped top. The whole interior is lined with acid-proof brick. Construction is such as to withstand a heavy steam pressure. The digesters are filled with chips which flow in by gravity from the bins overhead. The storage tanks for the acid are so elevated (shown at the left of Fig. 8), that the acid likewise flows in by gravity. Each unit, of which there are three at Newton Falls, is equipped with automatically registering pressure and temperature indicators. The capacities of these digesters is shown in the following table:

Ton Rating	Cords to Fill	Gal. Acid to Fill
7	11.5	22,696
5	10.	14,064
3	6.5	9,145

It is apparent that roughly 3,000 gal. of acid is used per ton of pulp produced. With wood coming directly through from the river an acid carrying a combined sulphite content of 1.2 per cent is used in standard practice.

Having filled a digester with chips, acid is run in until it covers the chips entirely. The steam is turned on slowly, the air forced out through the relief system and the cook begun. It is essential that the starting temperature be kept low, according to the scheme followed at this plant. It should be said in this connection, however, that there are about as many ways of cooking sulphite as there are cooks on the job. Yet this operation is the most vital in the entire process and it is one for which only empirical laws are known!

What is sought is to have the cooking acid react with the chips under conditions favorable to the forma-

tion of lignin compounds, soluble in an excess of warm water, and at the same time an easy bleaching, strong pulp, readily controlled in the beaters. Because of the almost infinite number of variables entering here, the difficulties encountered are great. What is actually done for the most part is to proceed by rule of thumb. The chemical engineer has a real problem of high-pressure, high-temperature digestion to solve in this connection. It is complicated extremely by the fact that even the chemistry involved is not thoroughly understood.

Because of the great variation in manner of cooking sulphite the following figures are interesting. While both long and short cooks are made here, the long (about 9 hours) is used mainly. The average maximum temperatures and time of cooking as employed over a considerable period at this mill are shown below. It will be seen that remarkable uniformity of cooking conditions over the period of 3 months was obtained.

	3½ Hr.	3½	4	4½	5	5½	6	6½	7	7½	8	8½	9	9½	10	Av. Time
Standard	224	235	242	254	260	268	278	286	290	293	295	298	298	298	...	....
Mos.																
1	234	243	250	256	262	267	271	276	283	286	290	294	298	298	299	10.6
2	234	241	242	253	254	266	272	277	283	288	292	296	300	304	303	10.4
3	233	239	246	254	260	266	271	277	282	287	292	295	297	...	...	11.2

These figures show that the chips are brought quite gradually to a temperature around 230 deg. F., then allowed to increase less rapidly to 6 hours, from which time on the relief prevents building up the temperature further.

Hemlock and spruce with a trace of balsam are the woods most commonly cooked here in the approximate ratio of 1 to 2 of the number of cooks of each. Experiments at this mill indicate the possibility of employing poplar on a large scale.

The measured pressure is found not to correspond with the measured temperature as the cook proceeds. By figuring the pressure corresponding to the temperature and finding the difference between this figured pressure and the measured pressure, it may be determined what pressure is being exerted by the gases formed by the reaction. When the maximum pressure desired has been reached, the cook begins to allow first liquor and then gas to escape. This process is called "relieving." He allows relief to be forced out through the specially constructed coolers as shown in Fig. 9. These coolers are built of several small lead tubes immersed in cold, circulating water. It is aimed to keep the relief slow at first, increasing it as the cook continues. When the temperature rises nearly to the limit set, the liquor exit ceases and gas flows out instead. The total amount of liquor and gas recovered in this way is about one-quarter the total amount used.

The Relief System

The liquor and gases are conducted to the bottom of one of the large tanks (Fig. 10), each of which holds about 30,000 gal. The small one on top of the three others is the one into which the raw acid is pumped and the one out of the top of which the unabsorbed gases are returned to the Jenssen towers for repassage through the absorption system there. In this way, as far as gas is concerned, the system is practically closed, the only outlet being at the top of the weak acid tower. One tank is used mainly for storage. Sufficient vacuum is maintained by the flow of the gas out of the small tank on top to keep drawing the gas through the system. Because of the insufficient absorption capacity of the present apparatus, a new tank to hold 90,000 gal. of liquor is now under construction to supplement the present lineup.

Having cooked the chips, the operator opens the valve at the bottom of the digester and the contents are blown under their own pressure into a large pit holding at least twice the pulp capacity of the digester. From this pit a vomit stack leads to the air and carries out the steam and fumes when blowing takes place. The pulp as it comes from the digester base still retains the form of the chips. When this hits the steel target which is placed on the side of the pit to withstand the force of the blow it is partly broken up.

Washing the Pulp

The pulp is washed for about 3 hours with warm water, the same as was used in cooling the burner gases. Drainer pits underlie the blow pit, carrying the wash water to the sewer. Something like 50 lb. per blow is lost in fiber, while about 75 per cent of the sulphite is lost. It is desirable to use warm solution at this point on account of the low cold water solubility of calcium lignates and the similar compounds formed. It is essential to remove these substances at this point if a good pulp is to be obtained without the excessive use of bleach and without difficulties in subsequent processing.

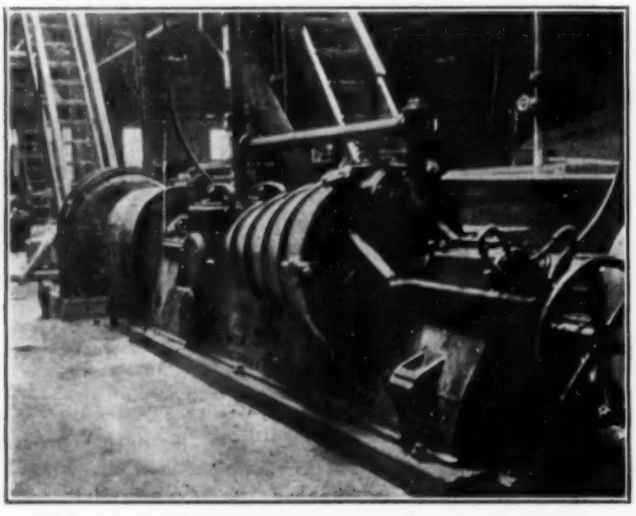


FIG. 11—JORDAN USED FOR SHORTENING FIBERS

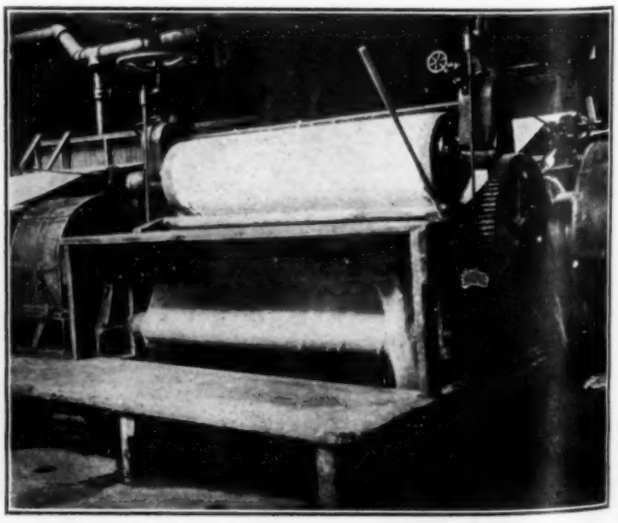


FIG. 12—WET MACHINE MAKING PULP INTO SHEETS

From the blow pits the sulphite pulp next goes to a large stock chest, from which it is pumped to headbox, which feeds the system in which a wet screening and refining of the pulp takes place. In machines called knotters but which are actually nothing more than selective rotary screens, hard lumps beyond a certain definite size are removed. Such lumps, including bunches of fiber called shives, ordinary knots, slivers, undigested chips, etc., are run through special refining apparatus called a jordan. This consists essentially of a cast-iron shell, the inside of which is fitted with long narrow steel knives or bars each more or less resembling the runner of a skate. This clears the inside conical plate by a very small distance, with the result that any degree of shearing desired may be obtained. It is shown in Fig. 11. The refined or disintegrated pulp from the jordans flows over two inclined screens in series, which pass through considerable of the water and the smallest fibers. The pulp itself is dropped by gravity to a special "screenings" chest, which feeds a wet machine, of which the function is to dry mechanically up to about 60 per cent moisture. From this machine, to be described later, similar to that shown in Fig. 12, the pulp comes in laps or sheets about 7x8 ft. and varying in thickness. When a low-grade paper is to be made, as for wrapping, this is the fiber used. In this way material too low in quality for the production of the regular products of the mill is put to service. This amounts to from 1.5 to 4 per cent of the total production of pulp. Since there is a market for screenings, a considerable amount of this fiber is sold directly as such from Newton Falls.

Path of Pulp to Bleachers

Our digression over screenings ended, we may continue the process of refining that is followed by the bulk of the pulp. After the knotters have taken out the undesirable lumps, etc., the pulp, diluted with more water (up to about 99.7 per cent H_2O), is flowed over a long "riffler." This is merely a box with felt bottom and submerged baffles at one end which are set at an angle and which serve to take out heavy foreign particles of any sort. Practically it is an application of the principles of hydraulic classification to the production of an uncontaminated pulp. There are two rifflers in parallel, each about 60x12 ft. These are used alternately a day at a time, one being cleaned while the other is taking care of the fiber.

From the rifflers, which have taken out most of the foreign material that could be separated because of greater gravity than was possessed by the pulp, the stock continues to rather an elaborate system of screens shown in sketch (Fig. 13). The layout here is ingenious as well as complex. The object is primarily to separate according to size, sending oversize fibers back to the jordan to be made into screenings stock. The screens are long boxes with brass bed plates in which lateral slits of uniform and progressively smaller size are used. They are actuated by a "trotter" underneath which gives them a constant up and down vibration and hence creates some vacuum for drawing the fiber through. This degree of vibration is carefully controlled as well as are the slits in the screens, the better to insure uniform results. The acceptable fiber is drawn through and flows out of a sidebox and by trough to a Woods machine, which is nothing more than a rotary filter that serves to take out part of the water as it comes from the screens. The white water or suspension

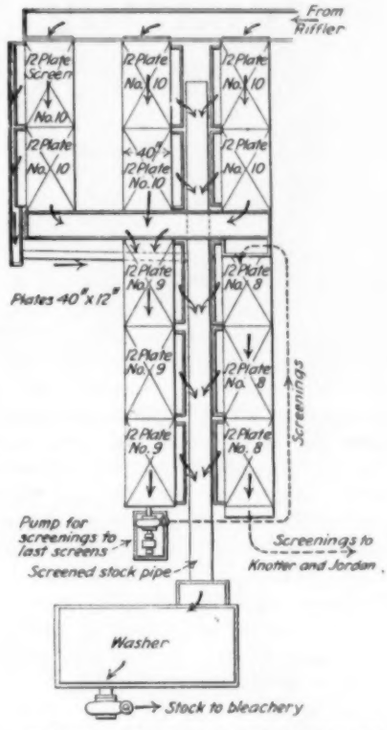


FIG. 13—SCREEN ARRANGEMENT FOR REFINING PULP

which passes through the filtering screen of this machine is flowed to a settling tank or "sulphite save-all." The overflow from this save-all goes to the sewer, while the settled fiber is pumped to the raw stock storage tank at the beginning of the refining system to be processed again.

As the pulp comes from the Woods machine it is dark cream or distinctly yellow in color. Before it can be suitable for the production of a high-grade white sheet this color must be removed. It is at this point that the Newton Falls process of bleaching begins.

(The bleaching system will be discussed in an early issue of Chem. & Met.)

Radiation From Sulphite Digesters

According to the recent report of the committee on waste of T.A.P.P.I., the radiation from the digester shell has been estimated to be ¾ to 1 B.t.u. per hour per degree difference in temperature per square foot of surface. It is now possible and practicable to cover digesters with insulating material in the form of asbestos mats, about 7½x3 ft., that conform to the shape of the digesters. Each section is held by hooks at the butt straps of the digester and adjacent sections are laced together with copper wires. By the use of digester insulation it is possible to reclaim much of the radiant heat. A conservative estimate of these radiation losses from a 10-ton digester is 7,000 to 8,000 lb. of steam per day, which at an average cost is equivalent to from $4 to $5 per 24 hours.

A New Method of

Preparing Specimens of Metals

That Should Give Us More Reliable and Consistent Information on the Structure of Metals Is Described

By H. B. Pulsifer
Assistant Professor of Metallurgy, Lehigh University

THE metallographic examination of a metal section is much too long at best. The surface to be observed must be cut out, it must be smoothed and etched, and then the negative and prints made. In order to reduce the labor to a minimum and yet procure the full delineation of all possible characters, the author entirely omits the finer polishing and metal flowing and starts the etching on the surface as smoothed with washed tripoli. Alternate etching and hand rubbing are continued until the picture is as much developed as desired. It is believed that this procedure is rapid, gives full characterization, and is the best way to teach students in classes studying metallography.

The usually prescribed sequences of surface finishing may well be typified by the outline and prints given in a recent Bureau of Standards circular. In this circular Mr. Rawdon has given us some of the details of finishing as well as a page of the stages of finishing in eight illustrated steps. After the preliminary smoothing with file or emery wheel he apparently recommends from six to eight applications of finer and finer abrasives until at last the surface is a featureless smooth mirror.

For some years the author has held the opinion that this typical method of preparing the surface is entirely too long, academic and opposed to the best obtainable results. It is held that scratches appear on the etching of the surfaces even after this treatment, and that one attack with the etching reagent does not adequately reveal the entire structure. A peculiar confirmation of the author's views has appeared in Sir George Beilby's book, "The Aggregation and Flow of Solids," published in 1921. A chapter of this treatise is devoted to demonstrating that polish is the result of surface flow. Beilby very elegantly and abundantly demonstrates metal flow in the polishing of copper, antimony and brittle speculum metal. He discloses the furrowed region below the surface after the flowed glassy surface has been etched away. He carries the demonstration to include even the polishing of calcite, glass and quartz. Many of the current descriptions of metal surface polishing read exactly as if they intended to follow the standard methods for flowing surfaces to produce mirrors; in other words, anything but the glass-free surface that should be best for revealing the structural feature of the metal crystals. It is significant that nearly all of the hundred and fifty prints of metal surfaces given by Rawdon in his circular show only the coarser structural outlines and that many of them have conspicuous scratch markings.

If the file marks on a metal surface are ground off with flour emery on a wet wheel, and then the emery marks are removed with tripoli, the ordinary materials of the iron, copper and zinc series are then ready to etch and hand-finish ready for photographing.

The author gives the tripoli-finished surface a deep etch, which should dissolve off all the mechanically flowed surface and the deeper scratches; the specimen is then rubbed by hand on a thick layer of wet levigated tripoli to smooth the etched and roughened surface. The etching is repeated with a shorter attack, the surface is smoothed on the board with gentler passes. A final etching should then display the structure to advantage. It is preferable to run with sufficient force on the damp heaped tripoli, which will wear off the metal as a black smear, rather than flow the surface by gentler passes over a thinly loaded fabric.

Depending on the rapidity of the etching reagent

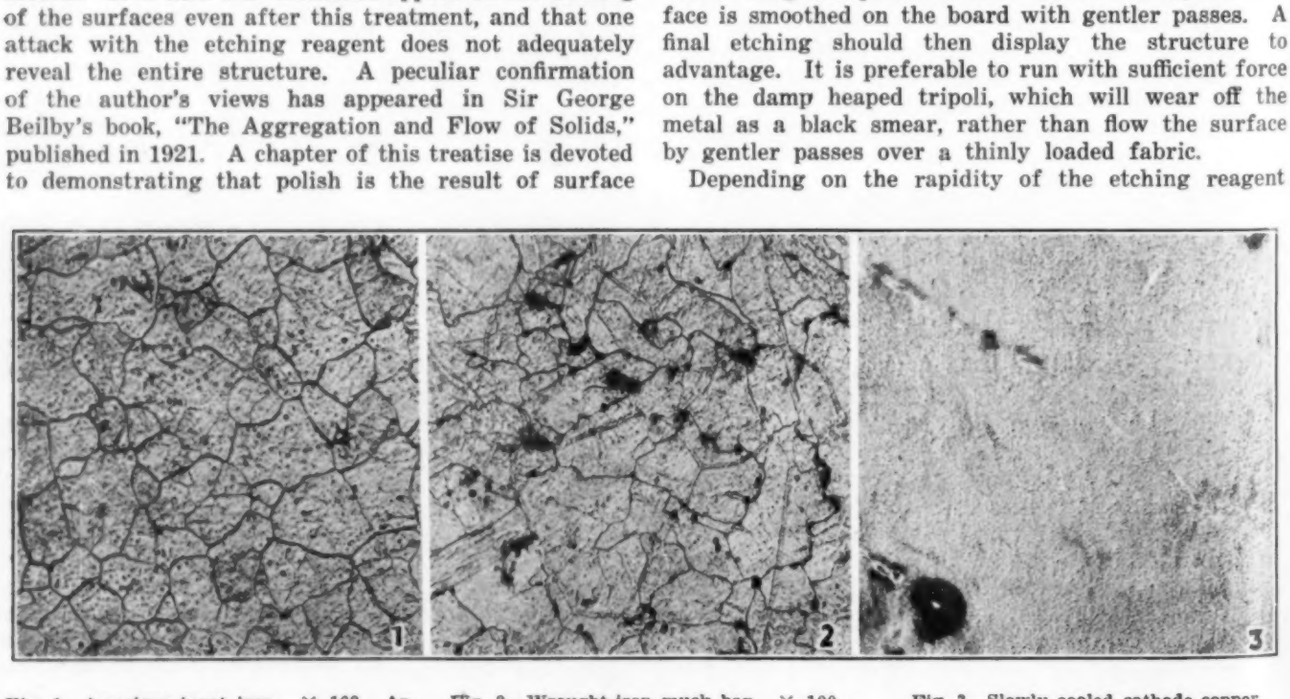


Fig. 1—American ingot iron. × 100. Annealed ferrite with sub-grains.

Fig. 2—Wrought-iron muck bar. × 100. Alpha ferrite with sub-grains and gamma phantoms

Fig. 3—Slowly cooled cathode copper. × 100. Primary dendrites marked by oxide and phantoms

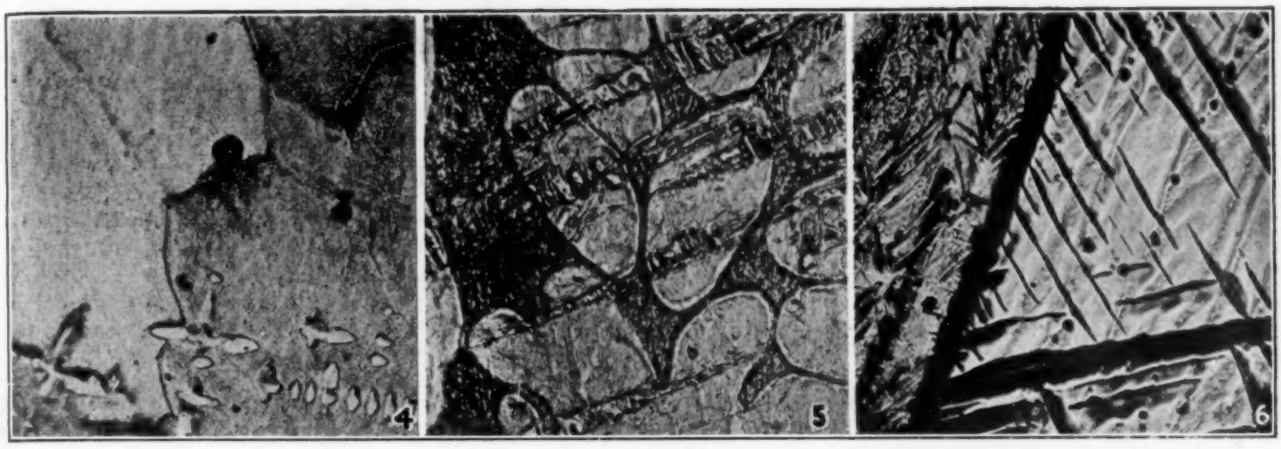


Fig. 4—Chilled furnace copper, × 100. Dispersed and massive copper in eutectic

Fig. 5—Chill cast pure zinc, × 100. Zinc caught during crystal growth

Fig. 6—Pure slab zinc, × 100. Lobes of the largest crystal joined in white sutures

and the skill of the operator, the entire finishing to a scratch-free surface need take only from 3 to 7 or 8 minutes. Students learn to do this easily and will prepare excellent surfaces in a few exercises. Picric acid in alcohol and nitric acid in alcohol are both good reagents for iron and steel materials; cold half and half nitric acid is excellent for the copper and brass series; the Palmerton chromic acid solution serves well for zinc.

Unusual Features by Deeper Etching

Fig. 1 is a print made from a sample of ingot made by the American Rolling Mill Co. The fully annealed iron etches rather slowly, giving a little orientated luster and throwing the grains into a combined polish and etch relief. The individual grains are seen to be traversed by numerous hair lines, which divide them into smaller units and suggest some previous stage in the growth of the present alpha ferrite grains. These sub-markings resemble the boundaries in the several stages of grain growth as pictured in recent metallographic contributions. However, these markings are in the massive metal and not surface relics only. Similar markings will be found to a less extent in published prints of many ferrites, although the several authors hardly mention the fact.

Fig. 2 is a print made from a sample of wrought iron made by the A. M. Byers Co. The alpha ferrite crystals are outlined in sharp black lines. Within the normal alpha crystals are hair lines as well as faint ridges. Most interesting of all, the entire area is seen to be embraced with a faint, double-lined, superimposed hexagonal network which is obviously nothing else than a previous gamma ferrite condition now discernible only by these phantom markings. Rawdon, of the Bureau of Standards, has obtained similar surface remains by etching at high temperatures; these markings were in a piece of muck bar and the material had presumably been made only a very few months when the print was taken. During the 2 years that have elapsed since the print was made the gamma phantoms as well as the sub-markings have completely disappeared. Those who manufacture wrought iron evidently have some interesting material for their metallurgists to report upon more fully.

Fig. 3 is from an electrolytic copper cathode which has been remelted and slowly cooled in the furnace. The end of the little flat ingot was found to be made of only two crystals, although the rows of oxide spots and the faint white markings plainly reveal the outlines of the dendrites first formed upon solidification. The entire field as seen in the figure is a small part of one of the crystal surfaces.

Fig. 4 is taken from a button of copper withdrawn during a furnace refining. The field is taken at the junction of the outside chill crystals with the inner layers of more slowly cooled metal. The large smooth units consist of the copper cuprous-oxide eutectic holding dispersed excess copper. Evidently the massive copper was unable to separate in the fringe of outside units, and abundantly scattered throughout the inner portions are the disconnected lobes of massive free copper.

Fig. 5 is from a sample of "Horsehead" brand zinc which was chilled in cold water while still molten. The dendritic lobes are seen enlarging in a ground of unorganized metal. Since the large columnar bandings are already crossing the disconnected lobes and are even visible in the ground mass, one concludes that atomic orientation had already taken place even before the metal solidified—that is, in the liquid melt. The little rounded cells so characteristic of rolled and slowly cooled zinc are already faintly visible at places within the lobes. That this print does not show dendrites in a field of eutectic is proved by the fact that it is "Horsehead" zinc, that parts of the same ingot more slowly cooled show the lobes joined into sutures, and that the same stock, furnace solidified, shows neither lobes nor sutures but very abundant bandings and the small cells typical of hot-rolled pure zinc.

Fig. 6 is from the zinc slab, part of which was remelted for the chilled and furnace cooled ingots. The large crystal with the bright surface shows numerous bandings and the suture lines made as the lobes of the big crystal joined. These white sutures are further characterized by the lines of oxide droplets. The white suture lines disappear if the metal is more slowly cooled.

All six figures have been prepared and finished by the combination method. It is not difficult to detect faint scratch markings in any of the prints, but it is presumed that few would find the scratches conspicuous. The relief obtained gives character to the metal and is not too deep for the focal plane of the objective at a hundred diameters magnification.

Oil Absorption by Paint Pigments

An Economical Paint Formula Often Depends on a Balancing of Linseed Oil and Pigment Costs—Here Are Some Comparative Absorption Values With a Definite Bearing on This Relation

BY O. A. HOUGEN AND H. D. HENTZEN
Department of Chemical Engineering, University of Wisconsin

THE amount of oil absorbed by a paint pigment is of importance in the making up of formulas for colors in oil and in estimating the cost of the finished product. This information is necessary in determining the proportion of oil and pigment required for a paste of a definite consistency.

The oil absorption factor is valuable when considering the ratio of the cost of linseed oil and the cost of pigment; thus if the oil were more expensive than the pigment, a low absorption factor would be desirable, while if the pigment cost were greater than the oil cost, a high absorption factor would be desirable. In this respect it is interesting to note the relation of French process zinc oxide and white lead (basic carbonate), the former selling at, say, 10 and the latter at 9½ cents per pound. The oil absorption factor of the zinc oxide, however, is almost three and one-half times that of white lead. With the cost of oil approximately twice that of the pigment, it may readily be seen that the zinc-oxide paste will be the more costly product.

The proportion of oil absorbed by a pigment will vary greatly with different pigments and will also be dependent on a number of factors such as particle size, the extent of grinding and the degree of deflocculation, or dispersion of the pigment. Furthermore, the kind of oil used will affect the oil absorption factor, in that some oils tend to flocculate and others to disperse the pigment particles. In the present investigation raw linseed oil was selected, because it is widely used in practice and also has very little effect on most pigments in dispersing or coagulating the pigment particles.

LIMITATIONS OF PREVIOUS METHODS

The chief difficulty in determining the amount of oil absorbed by a pigment is in obtaining a definite and reproducible end point or degree of consistency. Numerous attempts have been made to determine a suitable method that would overcome this difficulty. These methods have either been unsatisfactory or require too complicated equipment. Gardner and Coleman's test (see Paint Manufacturers' Ass'n of the U. S., Circular 85) consisted in dropping oil from a burette into a round bottom glass tumbler containing a definite weight of the pigment, and stirring with a blunt-end spatula until the pigment has absorbed just enough oil to wet the sides of the beaker. In this test, no grinding action of the oil into the paste took place. According to K. H. Barnard, the results are not comparable to practice, inasmuch as the extent of grinding is a factor in the amount of oil absorbed. (*Paint, Oil & Chem. Review*, 1920, vol. 70, No. 1, p. 8.) The changes in consistency of the samples worked with, the writers observed, were very marked after grinding, which seems to verify the claim of Barnard. As an example, a stiff paste made up of white lead and raw linseed oil was changed to a flowing consistency after grinding. This was true of most of the pigments worked with, though to a varying degree.

K. H. Barnard determined the oil capacity of pigments by grinding with oil and then thinning to such a consistency that 5 drops placed on a clean glass plate will flow 2 in. in 5 minutes when the glass is placed vertically. The criticism of this method is that for a given weight of paste applied over a given area the thickness of the paste film will vary with the density. On the other hand, if the paste were applied as a film of definite thickness, the initial surface covered will be increased, thus increasing the friction between the glass and the paint. Bingham and Green suggested the use of the plastisometer for these tests. (*Proceedings*, A.S.T.M., vol. 19, p. 691; vol. 20, p. 451.) Such an instrument was considered too complicated and expensive for most laboratories.

A NEW METHOD AND ITS ACCURACY

In order to obtain comparable values for a number of representative paint pigments it was therefore necessary to devise a simple reliable method of determining oil absorption. After considerable experimentation, the following method was found to give reproducible results: A definite weight of the air-dried pigment (about 25 grams) was placed in a small brass dish (height 1 in. and diameter 2 in.), and a raw linseed oil was added

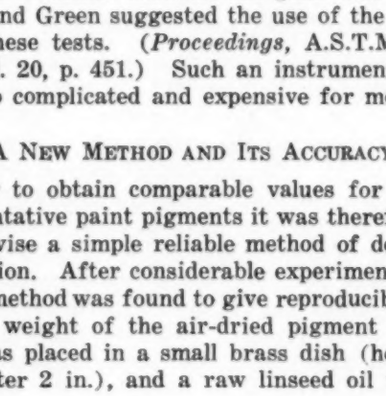


FIG. 1—MODIFIED VICAT NEEDLE APPARATUS

from a burette until all the pigment was taken up. The oil was mixed in with a spatula and after mixing was ground with the pigment with an iron rod ¼ in. in diameter and 3½ in. long with one flat end used for grinding. This grinding was continued until no scratches appeared, when a small amount was spread upon a clean glass surface. The relative measure of the consistency of the paste was obtained by means of a Vicat needle apparatus, such as is used in determining the consistency and rate of hardening of cement. However, instead of a needle point a disk, ¼ in. in thickness and 1⅞ in. in diameter, was attached to the plunger. The weight of the plunger, and consequently the pressure on the paste, was 280 grams. More oil was gradually added from a burette until a consistency was obtained such that the disk under its pressure load of 280 grams penetrated a distance of ½ in. into the paste in 1 minute. This end point consistency corresponds to the consistency of commercial paint pastes.

Factors Affecting Accuracy—Equal weights of the various pigments could not be conveniently used in the various tests due to wide variations in density of the pigments. In each case sufficient pigment was used so as to give a height of about ¾ in. of paste in the dish. Tests were made to determine whether a variable amount of the pigment-oil mixture in the dish affected the results. It was found that within wide limits the total amount of pigment used did not affect the oil-pigment ratio. Thus in the case of zinc oxide (French) a 25-gram sample gave result of 46.96 c.c. oil per 100 grams pigment and a sample of 35.5 grams gave a result of 44.9 c.c. oil per 100 grams of pigment. A smaller amount of pigment did not give sufficient material to run a test and more than 35.5 grams was too great an amount. A similar test on Chrome Green (Deep) on 35 grams gave result of 53.3 c.c. oil per 100 grams pigment, while 25 grams gave a result of 49.84 c.c. oil per 100 grams pigment. In no case was the variation greater than for duplicate tests; the maximum variation due to variation in the amount of pigment used was less than 4 per cent.

Two tests were run on each pigment. The experimental results in the accompanying tabulation show to what degree the tests check. To determine further the accuracy of the reproducibility of the method, the same batch was re-run on the testing apparatus a number of times. The results of these tests showed that the test was accurate on the same sample to within 1 or 2 per cent.

The observed measurements of oil absorption have been converted to a uniform basis such as number of c.c. of oil per 100 grams of pigment; number of gallons of oil per 100 lb. of pigment; number of pounds of oil per 100 lb. of pigment; per cent oil and per cent pigment. The results are also expressed on a ratio basis with zinc oxide as a unity.

TABLE I—OIL ABSORPTION DATA FOR REPRESENTATIVE COMMERCIAL PIGMENTS

(Raw linseed oil mixed with pigment in air-dry condition)

	C.C. of Oil per 100 Gr. of Pigment	Gal. of Oil per 100 Lb. of Pigment	Lb. of Oil per 100 Lb. of Pigment	Percentage — Oil	Percentage — Pigment	Rel. Basis ZnO as 1
White Pigments:						
Zinc Oxide (American)	45.93	5.5	41.8	29.5	70.5	1.0
Zinc Oxide (French)	64.5	7.74	58.5	37.0	63.0	1.4
White Lead (Dutch)	14.5	1.74	13.2	11.6	88.4	0.31
White Lead (Carter)	18.33	2.18	16.6	15.4	84.6	0.40
Lithopone	36.4	4.36	33.2	25.1	74.9	0.79
Metro-Nite	25.6	3.07	23.3	18.9	81.1	0.56
Blue Pigments:						
Ultramarine	37.23	4.47	34.0	25.4	74.6	0.81
Prussian	64.85	7.78	59.1	37.1	62.9	1.41
Green Pigments:						
Chrome Green (deep)	49.24	5.91	45.0	31.0	69.0	1.07
Chrome Green (light)	51.52	6.20	47.1	31.9	68.1	1.13
Yellow Pigments:						
Chrome Yellow (orange)	44.00	5.28	40.1	28.6	71.4	0.96
Chrome Yellow (medium)	60.1	7.2	54.7	35.3	64.7	1.31
Chrome Yellow (light)	72.0	8.65	65.7	39.7	60.3	1.57
French Ocher	50.3	6.5	46.0	31.7	68.3	1.1
Brown Pigments:						
Raw Turkey Umber	91.14	10.94	83.25	45.4	54.6	1.98
Burnt Turkey Umber	102.0	12.25	91.1	47.6	52.4	2.22
Raw Italian Sienna	77.99	9.35	71.0	41.5	58.5	1.74
Burnt Italian Sienna	67.11	8.05	61.1	37.9	62.1	1.46
Red Pigments:						
Vermillion	23.5	2.82	21.4	17.6	82.4	0.51
Indian Red	31.5	3.78	28.7	24.0	76.0	0.69
Rose Lake	48.0	5.75	43.6	32.4	67.6	1.07
Coach Red (light)	48.0	5.75	43.6	32.4	67.6	1.07
Red Lead	12.1	1.45	11.0	9.9	90.1	0.26
Iron Oxide	41.9	5.04	38.3	27.7	72.3	0.92

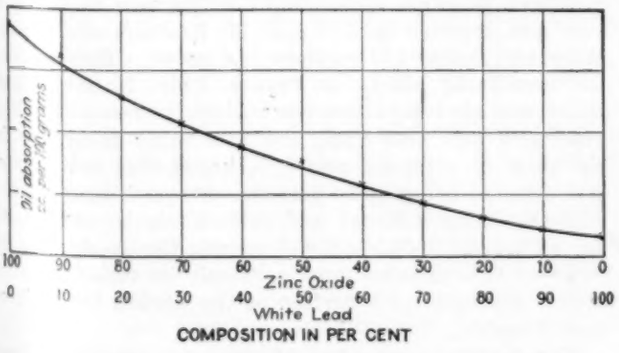

Oil absorption cc. per 100 grams
100 90 80 70 60 50 40 30 20 10 0
Zinc Oxide
0 10 20 30 40 50 60 70 80 90 100
White Lead
COMPOSITION IN PER CENT

FIG. 2—OIL ABSORPTION CURVE FOR ZINC-OXIDE-WHITE LEAD MIXTURES

Absorption by Pigment Mixtures

In order to determine whether the oil absorption of two combined pigments varied in direct ratio as their percentages in amount by weight, a test was run on mixtures of American process zinc oxide and Carter white lead, the composition being varied at each 10 per cent from 100 per cent zinc oxide to 100 per cent of white lead. The results, which are given in graphical form in Fig. 2, show that the absorption for the mixture is not a direct ratio, but is less than what would be obtained by calculation.

It is of interest to note the relation of the oil absorption factors of the French process zinc oxide and the American process zinc oxide. In the study of sizes of pigment particles, Henry Green found that the French process particles were smaller than the American process particles, the former varying from 0.4μ to 0.6μ and the latter from 0.3μ to 0.4μ. ("Microscopy of Paint and Rubber Pigments," *Chem. & Met.*, Jan. 10, 1923.) The results of this test show a high oil absorption factor for the French process pigment, which is smaller in size than the American process pigment. This would seem to confirm the view that the oil absorption value increases with decrease in size of the pigment particles—that is, increases with the extent of the exposed surface.

A comparison of the above values with published data obtained by different methods of testing is not dependable, since the end point of consistency used in the various tests was not the same. The similarity of some of the writers' results with those of H. A. Gardner seems to be only a coincidence. Gardner used a stiff paste as an end point but did not grind the oil and pigment, while the writers used a more fluid end point and ground the oil and pigment. The similarity of results might be explained by the possibility that for the same amount of oil used the greater fluidity obtained was due to grinding.

The Nitrogen Survey by the Department of Commerce

By Harry A. Curtis
Chief, Nitrogen Division, Bureau of Foreign and Domestic Commerce

From time to time *Chem. & Met.* has commented on the industrial significance of the important raw materials surveys being made by the Department of Commerce under the direction of Secretary Hoover. To date but little has been published regarding the progress of this work, and it is therefore a privilege to be able to present the accompanying article, in which Dr. Curtis briefly reviews the scope and present status of the Nitrogen Survey and explains the manner in which the information has been assembled. The final results and conclusions drawn from these raw materials surveys are to be incorporated in detailed reports to be made to Congress.

Dr. Curtis also requests us to say that in spite of certain unwarranted statements to the contrary, the Nitrogen Division has met with the fullest co-operation from all of the government bureaus with which it had dealings and that its investigators in the field have likewise received the fullest support.—Editor.

THE third deficiency appropriation bill passed by the last Congress carried an appropriation to enable the Department of Commerce to investigate and report upon various combinations in foreign countries in control of important commodities that affect the foreign trade of the United States. The general idea back of this Raw Materials Survey, as the project has become known, is to determine the situation with reference to all those raw materials basic to American agriculture or industry which are in any way subject to foreign control as to price or production. While the production of crude rubber is the particular item mentioned in the bill, it was recognized at the time that there are other raw materials in the same class, and the bill was purposely drawn to include these. In general, the Raw Materials Survey is being carried out under the supervision of the various commodity divisions of the Bureau of Foreign and Domestic Commerce. The Nitrogen Division was organized last May to investigate the situation with regard to supply and demand of fixed nitrogen for both agricultural and industrial use in the United States, with particular attention to the relation of our requirements to the Chilean nitrate industry. The urgent need of agriculture for cheaper nitrogenous fertilizer and the fact that the United States is buying more nitrate from Chile than any other country is buying, more in fact than all of Europe combined, without any voice whatever in deciding what the price of nitrate should be, give ample pertinency to the nitrogen survey as a part of the general investigation ordered by Congress.

Scope of the Nitrogen Survey

In planning the nitrogen survey it was recognized at the outset that there is available in technical literature a vast volume of information on various phases of the topic, and that it would be impractical to attempt a review of the whole subject in detail. The problem was to select and assemble such data from existing sources as would be needed, and to supplement these with investigations that would conform with the evident purpose for which the Congressional appropriation was made. Consideration of the proposed nitrogen survey with the above restrictions in mind led to the conclusion that adequate answers to the following questions might satisfactorily cover the ground:

(*a*) What is the agricultural situation in the United States with respect to fixed nitrogen supply?

(*b*) What is the lowest cost at which Chilean nitrate can be produced in Chile, and what range may reasonably be expected in the various factors affecting the cost of Chilean nitrate in the United States?

(*c*) Is there any reason for believing that an air-nitrogen industry will be able to compete with Chilean nitrate in supplying fixed nitrogen for agricultural purposes; and if so, how soon may we expect this competition to develop?

(*d*) What is the general trend in the domestic production of nitrogen compounds in the United States, and is there any likelihood of domestic production being able to meet the demand except through the establishment of an air-nitrogen industry?

In order to establish contact with the agricultural interests of the country, Dr. W. H. Walker and R. F. Bower, of the American Farm Bureau Federation, were added to the staff of the division. During the past summer Dr. Walker visited many of the agricultural experiment stations and agricultural colleges of the United States. Information has been supplied freely by these institutions. In this phase of the survey, and wherever agricultural matters have been involved, we have received most cordial support from the U. S. Department of Agriculture.

Field Investigation Made

Just how cheaply Chilean nitrate might be laid down in the United States is at present a matter of considerable importance, when our air-nitrogen production is getting under way, for the ability of the synthetic products to compete with Chilean nitrate will be the decisive factor in limiting growth of the nitrogen-fixing industry. For this phase of the nitrogen survey the services of Dr. H. Foster Bain, director of the Bureau of Mines, and of one of his assistants, H. S. Mulliken, were secured. These two spent the summer in Chile, observing mining and plant practices and conferring with a large number of the most active executives in the industry. The results of this field investigation are now ready for printing and will probably be issued as Part I of the general report of the nitrogen division.

There has been much progress in nitrogen-fixing processes since the war both in the United States and Europe, and a review of these developments was considered timely. F. A. Ernst was borrowed from the Fixed Nitrogen Research Laboratory for this part of the survey, and, together with Dr. J. M. Braham, also of the laboratory, spent the summer in Europe. They visited nitrogen-fixing plants in France, Italy, Norway, Germany and elsewhere and were cordially received. The results of this field study are now being assembled in the form of a report, and it is hoped that this report will serve to bring up to date the current history of the nitrogen-fixing industry and particularly to answer, as far as present indication will permit, the question as to whether this industry may presently be relied upon to supply a considerable portion of the world's fixed nitrogen demand.

The domestic production of nitrogen compounds from the processing of coal is steadily increasing and leads to

inquiry as to how far this domestic source of supply will go eventually in meeting the domestic requirements. This question quickly carries the survey onto the dangerous ground of prophecy, but only by projecting present trends into the future can we make shift better to meet new conditions as they arise. The data on fixed-nitrogen production from the coal carbonizing industries have been assembled by R. S. McBride, consulting chemical engineer, of Washington, who has had considerable experience in this line of work through preparation of yearly reports on coke and byproducts production for the U. S. Geological Survey.

New Blast Furnace Promising

The study of the reduction of iron ore in the blast furnace, which has been in progress for 4 years by the Bureau of Mines, Department of the Interior, at Minneapolis, and which has resulted in the successful development of an experimental blast furnace by the bureau's metallurgists, has yielded data that may lead to important modifications in the present design of blast furnaces. The Bureau of Mines engineers are able to make iron successfully in a small furnace stack only 20 ft. high, and the tests show that a considerable part of the stack is inactive, so far as reducing effect of the furnace gases on the ore is concerned, between the combustion zone and the zone near the top where reduction is actively going on. Since nothing happens in this part of the stack, if the same conditions hold true in commercial blast furnaces, the present tall stack universally employed could be shortened, thus reducing cost of construction, and size and cost of equipment such as the blowing engines that drive the furnace. Further work is being vigorously pushed with the object of tying up the experimental results with those obtained in commercial furnaces.

This furnace, the only one of its kind in the world, had been regarded as impractical by many leading iron metallurgists. The furnace has a hearth diameter of 20 in. and a height of about 20 ft., and two successful runs have been completed with every operating detail under perfect technical control. With this furnace, which can be operated at comparatively small expense, the Bureau of Mines is now in position to make a scientific study of the blast-furnace process and to attack various problems, the solution of which should be of value to the industry.

Pacific Coast States Import Silica Sand

The expansion of the glass industry in the manufacturing centers of the Pacific Coast region draws attention to the need for an adequate supply of high-grade silica sand. At present a large proportion of the total amount used comes from European countries, but it is more than probable that, assuming the discovery or utilization of nearby deposits or the discovery of freight rates from inland points, California may become independent of foreign supplies. It is, however, essential that producers should realize the importance of strict standardization of products, in regard to uniformity, composition and physical character. This subject has been studied by a committee on standards, Glass Section, appointed by the American Ceramic Society, and tentative specifications have been compiled.

Legal Notes

By Wellington Gustin
Of the Chicago Bar

Patentable Combination of Old Elements

Rule Designed to Assist in Correctly Applying the Law Distinguishing Between Invention and Mechanical Skill

IN A SUIT involving the Macbeth-Evans Glass Co. and the Smith Glass Co., the United States Supreme Court has denied a certiorari to the defendant, Smith Glass Co., thus upholding the decision of the Circuit Court of Appeals, which held that the Evans patent, No. 1,342,744, for a headlight lens was valid.

With a large number of patents prior in time and from the state of the art the defendant contended there was no invention disclosed in the Evans patent. But it was indisputable that Evans was the first to combine these three elements of his patent in one lens, namely:

(1) The visor, having an outer coat of substantially opaque green enamel for pleasing appearance, and an inner coat of white enamel to reflect light backward; (2) the outer surface of the lower portion of the lens having horizontal refracting ridges, with their faces inclined at a slight angle to the vertical to refract rays of light downwardly, and (3) the inner surface having alternating vertical concave recesses or corrugations to diffuse light laterally. There is no question about the fact that Evans was the first to unite these three desirable elements into one integral lens, the court found. No other person had combined the three elements in any kind of lens, integral or otherwise. Whether or not this union reached the height of invention or remained on the plane of mere mechanical skill was the real question in the case.

The law drawing the line of division between invention and mechanical skill is clear enough, but the correct application of that law to the facts in a particular case is often difficult, and is a fertile field for difference of opinion, says the court. The several elements in a patentable combination must conjointly produce a new and useful result. To this result every one of the several elements, acting according to its own mode of operation, contributes, and the court laid down the rule or definition for a patentable combination as follows:

"In doing its appointed share toward effecting the single result achieved by the co-operation of all, each element acts, of course, according to the law of its own being; but, of necessity so acting, it is still, none the less, combined with the others, and does 'qualify' each and all of them (not their distinctive method of operation), and in the sense that each is, by the co-operation of the others, capacitated to contribute, by acting in its own peculiar way, to the common end which, without the co-operation of each and every other of the co-ordinated elements, it would be powerless to accomplish or advance." (Dayton Malleable Iron Co., vs. Forster, Waterbury & Co., 153 Fed. 201.)

The court was of the opinion that the three elements, combined for the first time by the Evans patent jointly, met this test.

Flow of Fluids

The Articles Published Herewith Have Significant Bearing on the Technology of This Unit Process and Therefore Are of Interest to Production Men in the Chemical Engineering Industries

Simplifying the Solution of Problems of Fluid Flow

Some Notes on Methods of Calculation Which Eliminate the Procedure of Trial and Error Heretofore in Vogue

By Barnett F. Dodge
Chemical Engineering Department, Harvard University

THERE are six variables of prime importance in the handling of both liquid and gaseous fluids on an industrial scale. These are the pressure drop or loss of head, the diameter of the pipe line, the length of the pipe line, the velocity of flow or a related quantity, the volume transmitted, the density of the fluid and its viscosity. Problems arising in connection with the design or operation of equipment for handling fluids usually involve a calculation of one of these quantities, the five others being known or assumed. The usual problem involves the calculation of the pressure drop that will result when a given fluid is conveyed at a stated velocity through a given pipe line, or of the diameter of pipe necessary, or of the transmission capacity. Occasionally the length of the line is the unknown and there are a few cases where one may wish to know the density or viscosity of a fluid that will cause a certain pressure drop in a given pipe line when a known volume is flowing. The calculation of pressure drop or length is comparatively simple, but the calculation of the other quantities is not so simple, involving a trial and error method that is in many cases time-consuming and is apt to be very confusing to the uninitiated. The purpose of this note is to point out a simpler method for calculating these quantities which is applicable in practically all of the cases that arise in practice.

It is well known that there are two general types of motion that all fluids exhibit, known as viscous and turbulent flow. The type of motion that will obtain in any case depends on four of the variables enumerated above—namely, the velocity of flow (we may substitute the volume if we choose), the viscosity and density of the fluid and the diameter of the pipe. The mathematical formulation of the laws underlying each type of flow, though well known, is repeated here in order to make the following discussion clearer. Expressed in engineering units, the equations for the two types of flow are as follows:

It would be hard indeed to find a chemical engineer in industry who is not fundamentally interested in the flow of fluids. In almost any industrial process some material will be handled in the liquid or the gaseous phase. Hence the pipe line is as usual and essential a part of most manufacturing establishments as are the buildings

Because this is true, there is nothing so often necessary when establishing a new process or revamping an old one as to determine the size of a pipe line. This is easy enough when water or steam is the material the pipe line is to convey, for there are tables available to help. But when it comes to other substances it has heretofore been a case of cut and try or else of going through some mathematical gymnastics. The paper given here points a way to a much simplified procedure.

For viscous flow

$$p = \frac{0.000668zlu}{D^2} \qquad (1)$$

For turbulent flow

$$p = \frac{0.323flsu^2}{D} \qquad (2)$$

where p = pressure drop in lb. per sq.in. across the section of pipe of length 1 ft.

z = viscosity relative to water at 68 deg. F.

u = average velocity of flow in ft. per sec.

s = specific gravity of fluid, relative to water at 4 deg. C.

D = pipe diameter in inches.

f = a friction factor.

The friction factor f may be shown, by dimensional reasoning, to be a function of the ratio $\frac{Dus}{z}$. One of the most recent determinations of the form of the function gives the following for the range generally met with in commercial piping (see Wilson, MacAdams and Seltzer, *J. Ind. Eng. Chem.*, 1922, vol. 14, p. 105.)

$$f = 0.01\left(\frac{Dus}{z}\right)^{-0.3} \qquad (3)$$

Actually the function is a more complex one, but this form is sufficiently accurate for all ordinary work and will serve as well as any other to illustrate the point to be brought out later. The ratio $\frac{Dus}{z}$ has the same value for all fluids (regardless of whether they are gases or liquids) at the critical point, which is the point of transition from one type of flow to the other. For commercial pipe this value is about 0.12. It follows that this ratio may be used as a criterion of the type of flow; for values greater than 0.12 the flow is turbulent and when it is less than 0.12 the flow will be viscous.

For the calculation of p, the pressure drop, or l, the pipe length, the procedure is as follows: From the known values of D, u, s and z, valuate

the ratio $\frac{Dus}{z}$ and by means of the criterion, determine whether the flow is viscous or turbulent. If $\frac{Dus}{z}$ is less than 0.12, solve p or l by equation (1); if greater, determine f by (3) and then solve (2) directly for p or l. We may, of course, substitute for f in (2) its values given by (3) and obtain the following equation for turbulent flow:

$$p = \frac{0.003231 s^{0.5} u^{1.5} z^{0.5}}{D^{1.5}} \qquad (4)$$

This equation may be obtained directly by the method of dimensional analysis (except the numerical values of the constants), but the other, more empirical formula is somewhat simpler to use in many special cases where one is able to estimate f very closely from some previous experience. Wilson, MacAdams and Seltzer give a still

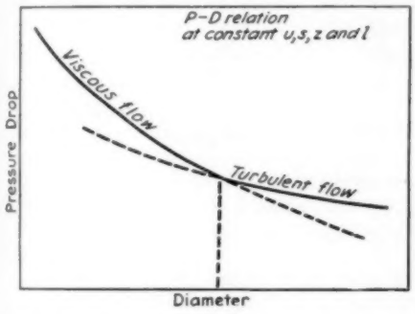


FIG. 1—Curves showing effect of pressure and pipe diameter on flow of fluids with velocity, specific gravity, viscosity and length of flow constant.

shorter method of calculating p or l involving the use of only one equation, provided one has available a plot of f as a function of $\frac{Dus}{z}$ for both the viscous and turbulent regions. There is still another method of calculating p which depends on the principles to be discussed later, but we shall call attention to it here. Solve for p by the two equations (1) and (4) and take the larger value. This is probably the shortest method if the f plot is not available and will give the correct result without the necessity of determining what type of flow will exist under the given conditions. The reason p and l are easy to calculate is because they do not appear in the criterion for the type of flow and therefore all the factors which determine this are known. On the other hand, if the diameter is to be calculated, trouble immediately arises from the fact that the diameter must be known before the type of flow and hence the equation to use can be determined. One method that has been used as to assume a value for f and then calculate D by equation (2) and then substitute this value of D in equation (3), and if it gives the assumed value for f, then D is correct. If it does not, the process must be repeated until a value for f is found that satisfies both conditions. In case the flow is in the viscous region, this trial and error process will eventually give a value of f as calculated from equation (3) that is greater than the critical value, which is about 0.017 for ordinary pipe. This is an indication that the flow is viscous and one may then calculate the correct D by equation (1). Another method is to start with a guess of D, calculate f by (3) and then p by (2). If the guess is correct, the p calculated by (2) will agree with the given p. If not, the process must be repeated with another assumption of D. If the assumed D gives a value of f greater than 0.017, then use equation (1). It can be seen that this process may be time-consuming if the initial guess was bad and is apt to be confusing if one happens to guess in the wrong region of flow. Hence the desirability of finding a better means for calculating D.

Of course in many cases there is no question as to the type of flow and there is no need to resort to such a trial and error process. For instance the flow of gases under ordinary conditions of temperature and pressure in pipes of commercial size is practically certain to be turbulent. The same applies to the flow of water. But in the case of many liquids of higher viscosity than water and gases under high pressure or very low velocity the type of flow is often uncertain. For such cases a simpler and more certain method is desirable.

Such a means may be obtained from a consideration of the forms of the equations. If D is the unknown, we may, for our purpose, simplify (1) and (4) to

$$p = \frac{K_1}{D^3} \text{ (viscous flow)} \qquad (5)$$

and

$$p = \frac{K_2}{D} \text{ (turbulent flow)} \qquad (6)$$

Differentiating, we obtain the slope of the p-D curves at constant z, u, s and l.

$$\left(\frac{\delta p}{\delta D}\right) \text{visc.} = -\frac{2K_1}{D^3} \qquad (7)$$

and

$$\left(\frac{\delta p}{\delta D}\right) \text{turb.} = -\frac{K_2}{D^2} \qquad (8)$$

At the critical point—that is, the point where the transition from one type of flow to the other occurs—the two curves must cross, and hence at this point the same value of p and D satisfies both equations. Equating p, we get

$$\frac{K_1}{D^3} = \frac{K_2}{D} \text{ or } K_1 = K_2 D$$

Substituting this value of K_1 in (7), we obtain

$$\left(\frac{\delta p}{\delta D}\right) \text{visc.} = -\frac{2K_2}{D^2} \qquad (9)$$

Comparing (8) and (9), we see that the slope of the viscous flow curve is greater than that of the one for turbulent flow at the critical point, and therefore if we imagine each curve continued beyond the critical point, the curve for the stable type of flow will lie above the curve for the flow that is unstable. From a consideration of the criterion, $\frac{Dus}{z} = 0.12$, we see that large values of D at constant u, s and z are associated with turbulent flow. With these facts at hand, we can now plot the general nature of the p-D curves for the two types of flow. This has been done in Fig. 1. These curves were simply sketched from the general facts deduced above. Referring to this figure, the point where the two curves cross is the critical point. The vertical line dropped from this point to the D axis intercepts the latter at a point which may be called the "critical diameter." (The term "critical velocity" has been very much used in literature on flow of fluids, but for some unknown reason the concepts of "critical diameter," "critical volume," etc., have not been used to the author's knowledge, though they are entirely analogous to the "critical velocity" and in some cases more useful.) For all diameters larger than this the flow is turbulent; for all smaller diameters it is viscous. Strictly each curve ends at the critical point, but in the figure each curve is extended beyond by a dotted line. The dotted lines may be considered as representing an unstable form of flow which would exist if for any reason the transition were delayed. This is exactly analogous to an unstable phase such as a supercooled liquid. For a given p it will be noticed that in either region the correct diameter—that is, the one corresponding to the stable type

of flow—is the larger one. From this fact we may deduce the following rule for calculating diameter: Calculate D, using both the viscous and turbulent flow equations, and take the larger value. This requires no knowledge of the type of flow or of friction factors, and no guessing process.

To be still more explicit, we give below the two equations to be solved for diameter:

$$D = 0.0258\sqrt{\frac{zlu}{p}} \quad \text{(I)}$$

$$D = 0.00841\sqrt[3]{\frac{ls^{0.5}u^{1.8}z^{0.2}}{p}}$$

$$\text{or } 0.00841\frac{l^{0.65}s^{0.47}u^{1.8}z^{0.37}}{p^{0.63}} \quad \text{(II)}$$

In many cases, possibly the majority, where it is desired to calculate D, the volume to be transmitted through the line, rather than the velocity, is given. For this case, using exactly the same reasoning as above, we can determine the general form of the p-D curves at constant V, z, l and s. From the plot of these curves in Fig. 2, we see that for this case the correct diameter is also the larger one. The equations in terms of V rather than u are:

$$D = \sqrt[4]{\frac{0.123zlV}{p}} \quad \text{(III)}$$

$$D = \sqrt[4.8]{\frac{38.21s^{0.8}V^{1.8}z^{0.2}}{p}}$$

or

$$D = \frac{2.14l^{0.21}s^{0.11}V^{0.38}z^{0.42}}{p^{0.21}} \quad \text{(IV)}$$

where V = cu.ft. per sec.

The rule for calculating D when V, s, l, p and z are given is as follows: Solve for D by equations (III) and (IV) and take the larger value.

Turning to the case of the calculation of the transmission capacity or the velocity of flow, we again use this same method. In this way we find the slope of the p-V curves for turbulent flow to be the greater. Then from a consideration of the criterion of flow, $\frac{Vs}{Dz} = 0.00066$, which is simply the former criterion —namely, $\frac{Dus}{z} = 0.12$ with u replaced by its value in terms of V and D—we see that small values of V are associated with viscous flow and vice versa. $\frac{Dus}{z} > 0.12$ for turbulent flow and therefore $\frac{Vs}{Dz} > 0.00066$ for turbulent flow.

We can now draw the p-V curves at constant D, z, l and s. From Fig. 3 we see that in both regions the smaller of the two values of V is correct for the stable type of flow. Analogous to the case of diameter, we may call the volume where the two curves cross the "critical volume." The equations for the volume are as follows:

$$V = \frac{8.18pD^4}{zl} \quad \text{(V)}$$

$$V = 755\sqrt[1.8]{\frac{pD^{4.8}}{ls^{0.8}z^{0.2}}}$$

or

$$V = \frac{7.55p^{0.56}D^{2.7}}{l^{0.56}s^{0.44}z^{0.11}} \quad \text{(VI)}$$

Rule for calculating V: Solve (V) and (VI) for V and take the smaller value. In case we wish to calculate velocity, in which case V is no longer an independent variable, the same process of reasoning leads to the following rule:

Solve the following equations (VII) and (VIII) for u and take the smaller value.

$$u = \frac{1497pD^2}{zl} \quad \text{(VII)}$$

$$u = 24.0\sqrt[1.8]{\frac{pD^{1.2}}{ls^{0.8}z^{0.2}}} \quad \text{(VIII)}$$

Although the calculation of s and z is of much less importance, we give below the methods for the sake of completeness. There are four cases in all, two when u is taken as the independent variable and two when V is taken as the independent variable. Only the case of V as independent variable is treated below.

$$z = 1.24 \times 10^{-8}\frac{p^2D^{16}}{l^2s^4V^6} \quad \text{(IX)}$$

$$z = \frac{8.18pD^4}{Vl} \quad \text{(X)}$$

Rule: Solve for z by equations (IX) and (X) and take the smaller value. It will be noted that in turbulent flow z is enormously effected by any change in D or V, or conversely, z can be changed within wide limits

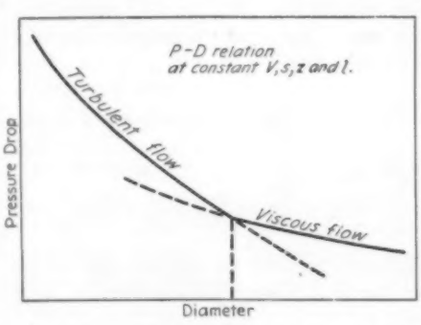


FIG. 2—Curves showing effect of pressure and pipe diameter on flow of fluids with volume of flow, viscosity, specific gravity and length of flow constant.

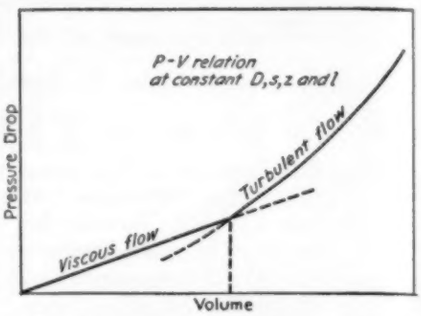


FIG. 3—Curves showing effect of pressure and volume on flow of fluids when diameeter, viscosity, specific gravity and length of flow are constant.

without having much effect on the diameter of pipe required or the volume that can be transmitted, or even on the pressure drop. In the case of viscous flow, on the other hand, s has a decided effect on p and V and a lesser effect on D.

The case of s is somewhat different, because s does not appear in the viscous flow equations, or in other words, in viscous flow the pressure drop is entirely independent of density (or specific gravity, which is relative density). From the criterion we see that $s = \frac{0.00066Dz}{V}$ at the critical point and larger values of s correspond to turbulent flow. From equation (4)

$$S = 0.0105\sqrt[0.8]{\frac{pD^{4.8}}{lV^{1.8}z^{0.2}}} \quad \text{(XI)}$$

To determine what value of s will give the desired pressure drop under the given conditions, solve for s by this equation. If this value of $s > \frac{0.00066Dz}{V}$, it is the value desired; if it is less, the flow is viscous and then there is no further object in determining s, because viscous flow is entirely independent of s. Just as in the case of diameter, velocity, etc., it is sometimes convenient to refer to a "critical viscosity" and a "critical density."

We may also arrive at these same conclusions for the calculation of D, u, s, z and V in a more general way from a consideration of the general principles of mechanical stability. The stable type of flow will be the one with the lesser potential energy and hence the one which gives the greater pressure drop, other factors being constant. Then considering the relation between p and x, where x stands for any one of the variables V, u, s, z or D, if p varies as x, for a given p the smaller x will be the correct one; or, if p varies inversely as x, the larger x will be the correct one.

Equipment News

From Maker and User

Improvements in Fan Design

Interchangeability of Parts, Self-Contained Bearing and Support and New Type of Housing

A new reversible fan housing with tripod bearing, called the Type H fan, is announced by the Buffalo Forge Co., Buffalo, N. Y., for its fans of the following styles: Niagara Conoidal, Turbo Conoidal, Duplex Conoidal and Steel Pressure Blowers, sizes 2 to 6 and capacities up to 4,000 ft. per minute.

This housing is adjustable for any discharge in any angle of a vertical plane and can be made either right or left hand as required. It consists of three parts, a shell and two demountable side cover plates. In one of these side plates is the inlet, while the other supports the shaft and bearings. To change the hand of the fan, these cover plates are reversed. For changing direction of discharge it is only necessary to loosen the assembly bolts in the ring of each side plate and two staybolts in each side of the fan, then revolve the housing until the discharge points in the desired direction. These fans, generally speaking, are reversible for only three positions, no bottom horizontal being feasible because of closeness of bearing center to floor. If this discharge is necessary, however, the base can be raised by putting it on a platform of some kind, sufficient to allow for swiveling the discharge to this position.

The housing of the fan is made on the so-called rivetless system. The steel scroll sheet after being cut out to size is stamped along the edges in a reversed U-shaped scarfing, while the two plates forming the side walls of the shell are punched with holes corresponding in size and spacing to the scarfing or projections on the edge of the scroll sheet. Assembly of the housing then consists merely of fitting each side of the housing plates to the projections in the scroll plates and then expanding these projecting edges to make a tight-fitting union. By use of this method the makers claim that all rivets are eliminated in assembling, the inside of the fan housing presents a perfectly smooth surface with no frictional points as with plates riveted or bolted to angle irons and the efficiency of the fan, through elimination of internal friction for the air and the making of a tighter fitting union at the joints, is increased.

TYPE H FAN ASSEMBLED

FAN ROTOR, SHOWING TRIPOD BEARING

In this new fan the tripod bearing bracket takes the place of a heavier cast-iron bearing stand with a separate base. This bearing, as the name implies and as shown in the accompanying cut, is in the shape of a bracket with three arms of "T" section and is attached direct to the fan housing. A strap $\frac{3}{8}$x1$\frac{1}{2}$ in. forms a binding band on the inside of the housing for the tripod and reinforces the sides. The bearing consists of two split bearings, bored and reamed, with bronze bushings inserted.

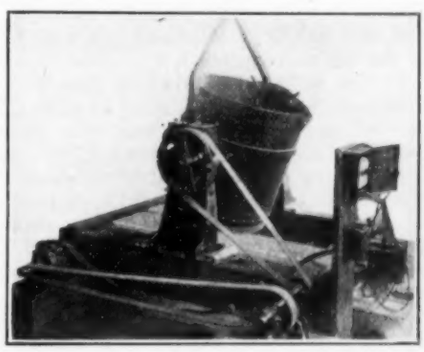
These fans, in addition, are generally fitted with Type "D" wheels and take standard Type "D" capacity tables. All shafts are ground and the liners reamed to exact size. The bearings, cast as one unit, insure perfect alignment and they are more accessible for repairs and inspection. The weight is considerably reduced.

The overhung feature of this fan, effected by the tripod arrangement, makes for decided advantage in changing pulley sizes. These fans are essentially for pulley-driven jobs, but they can be made for direct motor drive as well by placement of a sub-base for the motor and connecting it to the shaft by means of a flexible coupling. The tripod bearing has a large oil reservoir, a hinged cover plate over the oil ring and a drain plug and overflow opening with cover. The side sheet is clamped against the housing with clips which may be loosened by slacking off the bolts just as with the planing mill exhauster.

Test of Ladle Gearing

The Whiting Corporation of Harvey, Ill., Put a Standard Crane Ladle to a Strenuous Test

An 8,000-lb. capacity crane ladle was set in a pair of standards arranged so that ladle could revolve continuously in either direction, as shown in accompanying photo. A standard helical-worm gear bracket was mounted on ladle trunnion, hand wheel removed and 18-in. pulley put on in its place. A 2-hp. motor was set to drive ladle through jack shaft so that hand-wheel shaft was running approximately 94 r.p.m. Ratio of gearing was 58-2/7 to 1, the ladle revolving 1.6 r.p.m. A revolution counter was mounted on the idler trunnion of the ladle and an Esterline recording wattmeter was mounted in the motor circuit, showing graphically the power required to drive the ladle at all times. A counterweight consisting of round steel plates weighing 500 lb. was attached to the bottom of the ladle, this weight being sufficient to put a load on the gearing equivalent



WHITING LADLE ARRANGED FOR TEST

to the maximum load encountered while using this same size ladle in the foundry.

During the test the maximum power was required only at one point during the revolution of the ladle, when the counterweight was at its greatest horizontal distance from the center of the trunnion. Starting with the ladle in vertical position with counterweight at the bottom and turning the ladle 90 degrees gave approximately the same amount of work for the gearing to perform as if the ladle had been used to pour its capacity. On this basis, one complete revolution of the ladle in the test is equivalent to using the ladle twice.

After 6,000 revolutions of the ladle (equivalent to about 10 years' service), the bronze bushings in the bracket were carefully examined and found worn perfectly smooth and only a very few thousandths of an inch loose. It should be noted here that the pressure on the bearings of the hand-wheel shaft, due to the weight of the pulley and the tension in the belt, was several times as great as would occur in ordinary operation. The power input to the motor averaged 0.8 kw. at the peak and 0.2 kw. while counterweight was traveling downward. Gredag 314 was used throughout the test, and proved to be a very satisfactory lubricant for both gears and bearings. As a result of this test, the Whiting Corporation believes that its standard helical-worm gearing should outlast the ladles to which it is attached, barring accident and assuming ordinary attention to lubrication.

Soderberg Self-Baking Continuous Electrodes

The Soderberg electric furnace electrode is now being handled in this country by the Electric Furnace Construction Co. of Philadelphia. This device is quite extensively used in Europe and was described in detail in *Chem. & Met.* by its inventor, June 21, 1922.

The Soderberg electrode is a continuous electrode, made, baked and consumed in the same furnace. A raw mix of carbonaceous material is tamped into a ribbed cylinder of light-gage metal, thus forming the electrode. The baking process is accomplished by the waste heat. As the electrode is consumed, it is lowered into the furnace and new sections of casing are added at the top as required.

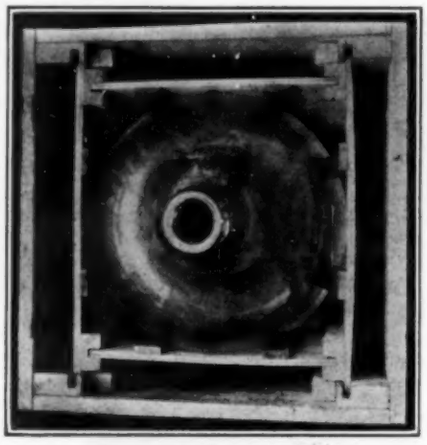
It will be at once evident that the limitation heretofore existing as to the size of single electrodes has been removed by the Soderberg method.

Soderberg electrodes, 40 in. in diameter, are in regular successful operation in Europe and large rectangular sections are also in use. Enough experimenting has been done to prove that electrodes 100 in. in diameter are entirely practicable. Special shapes, hollow electrodes of large diameter, electrodes with central water-cooling are feasible.

Improved Box for Carboys

The problem of obtaining a suitable box in which to pack carboys for shipment is one that interests many chemical plants. A solution is offered by the Hercules Carboy Box Co., Newark, N. J., which has placed on the market the box illustrated herewith.

The features of this box are that it



HERCULES CARBOY BOX

eliminates the use of packing by means of the wooden partitions shown in the photo and that it also reduces breakage. The partitions, which are under the carboy as well as at the sides, are flexible and give a cushioning effect that the makers claim has resulted in an almost complete elimination of broken carboys.

Low-Pressure Venturi Oil Burner

A new spray burner for fuel oil that has met with a wide application in industry since its appearance on the market is the Hauck venturi low-pressure oil burner. This apparatus, which is designed to burn fuel oil, operates on air pressures of from 8 oz. to 2 lb.

The low-pressure air is introduced into this burner at two points, for the purposes of atomization and combustion respectively. The air for atomization enters a venturi-shaped tube through four tangential slots, which imparts a whirling motion to it. It strikes the oil, which is broken up by a separate orifice, at right angles at the most constricted point in the tube. Because of the action of the venturi, the air velocity is the greatest at this point and the oil stream is broken up and atomized.

The atomized oil and the first stream of air then pass out of the venturi tube and are met by the second supply of air—that for combustion. It is thoroughly mixed with this air and then passes into the furnace for combustion.

The Hauck Manufacturing Co., Brooklyn, N. Y., which manufactures this device, claims that it is a perfectly balanced atomizer, giving correctly proportioned air and oil mixtures with only 8 oz. to 2 lb. air pressure and with 2 lb. or more oil pressure. Valve adjustment is used for control of the combustion and regulation of the flame and the manufacturers claim these can be accurately maintained.

Special Lift Truck for Users of Skid Storage

A new low-lift electric industrial truck is announced by the Elwell-Parker Electric Co., Cleveland, Ohio. This truck has been specially designed for use in plants where loads are handled on skids by hand lift trucks. In plants where large numbers of such skids are employed or there are any long hauls, the power truck is expected to prove a necessary adjunct to the hand lift truck equipment.

Catalogs Received

ACHESON GRAPHITE CO., Niagara Falls, N. Y.—A booklet entitled "Cold Roll Neck Lubricants," which describes the uses of the company's series "R" Gredag lubricant in the steel mill.

HENRY KASTENS, 418 W. 27th St., New York City—Folder showing various models of the "Master Model Time Stamp," a machine for recording and printing automatically minute, hour, a.m., p.m., month, day and year.

ABBÉ ENGINEERING CO., 50 Church St., New York City—Bulletin 20. A new issue of this company's general bulletin describing its line of pulverizing, grinding and mixing machinery.

BETHLEHEM STEEL CO., Bethlehem, Pa.—Publication 26. A book entitled "Bethlehem Mayari Pig Iron," describing the manufacture and use of this natural nickel-chromium alloy iron for making high-grade castings.

GENERAL CARBONIC CO., 542 5th Ave., New York City—A folder entitled "Why the Hand Pump?" which describes the use of liquefied carbon dioxide gas under pressure for use in overcoming pipe stoppages.

FOAMITE-CHILDS CORPORATION, Utica, N. Y.—A folder describing the Foamite Pumper, which is a fire-fighting unit made up of a 1,400-gal. tank of Foamite-Firefoam mounted on a Mack chassis, 7½-ton, truck, together with centrifugal pump driven from the truck motor for pumping the Foamite.

M. KEITH DUNHAM, 110 South Dearborn St., Chicago, Ill.—A book entitled "Oxygen From the Air," which describes the plant and process employed in producing oxygen from the air by the "Oxeco" liquefaction method.

BARTLETT HAYWARD CO., Baltimore, Md.—A new catalog describing the Kennedy automatic control of water-gas sets, which is manufactured by the Bartlett Hayward Co.

BROWN INSTRUMENT CO., Philadelphia, Pa.—A folder describing the use of the Brown pyrometers in the Nordyke & Marmon factory in Indianapolis.

ELECTRIC FURNACE CONSTRUCTION CO., Philadelphia, Pa.—A folder describing the Soderberg Continuous Electrode, which is now manufactured and sold in the United States by this concern.

W. A. JONES FOUNDRY & MACHINE CO., Chicago, Ill.—Catalog 27. A general catalog describing the full line of pulleys which this company manufactures. Catalog L-28—A complete catalog on various types of friction clutches, giving price lists, dimensions, illustrations, horsepower ratings and other valuable data.

NORTON COMPANY, Worcester, Mass.—Catalog entitled "Alundum Safety Treads," which describes the installation in the new Hotel Statler, Buffalo, N. Y.

F. J. RYAN & CO., Philadelphia, Pa.—Bulletin 5A. A bulletin descriptive of automatic and temperature control for oil- and gas-fired furnaces.

TOCH BROTHERS, 110 East 42nd St., New York City—An illustrated and descriptive bulletin issued on the occasion of the seventy-fifth anniversary of this concern in the paint-manufacturing business.

Review of Recent Patents

Sulphur Dioxide From Crude Sulphur

Method Outlined in Recent Patents for Overcoming the Difficulties Caused by the Impurities Usually Present

THE operators of many industrial processes, such as bleaching, burn sulphur in producing SO_2. They are naturally interested in anything that promises to make this operation cheaper and more efficient. Trouble has been experienced due to the fact that the petroleum contained in the crude sulphur reacts with the sulphur to form a sort of asphalt which forms a surface film and extinguishes the burning sulphur. To obviate this it has been necessary to go to the expense of either burning refined sulphur or using an elaborate and costly burning procedure.

In two recent patents, William H. Kobbé (1,469,644 and 1,469,645, assigned to Texas Gulf Sulphur Co., Oct. 2, 1923), has outlined methods by which crude sulphur may be cheaply employed in SO_2 production, when burned in open pans. The patents propose the use of several open pans piled one upon the other, either as shown in Fig. 1 or in some similar way. Sulphur is burned in these pans simultaneously and the heat from one is transmitted to the others. It is claimed that in this way complete burning of the sulphur is insured in at least one of the pans and generally in all of them.

An investigation carried out by the patentee illustrates the advantages claimed from the burning of sulphur in accordance with the invention. Numerous experiments have shown that when sulphur is burned in single open pans or receptacles only about 24 per cent of the sulphur is consumed, the remaining 76 per cent being left unburned. These experiments were conducted with sulphur obtained from wells of the Texas Gulf Sulphur Co., at Gulf, Tex. In one of a number of investigations recently conducted with sulphur from the same source and of substantially the same grade, three iron pans 3 in. deep and 18x12 in. in section were employed in superposed arrangement. Eight and one-third pounds of sulphur was placed in each pan, making a total of 25 lb. of sulphur for the entire burner. The sulphur in each pan was ignited near the center, and the pans were placed in position one above the other. In about 20 minutes the upper layer of sulphur in each pan had melted and the asphaltic film had formed. At the end of 25 minutes, the sulphur in the lower pan was burning at a relatively low ebb, but the sulphur in the upper pans was beginning to burn more rapidly. At the end of 30 minutes, the sulphur in the upper pans was burning fiercely, and the sulphur in the lower pan was burning with more vigor. The sulphur in the lower pan soon reached substantially the same intensity of combustion as the sulphur in the upper pans and at the end of an hour after ignition the sulphur in all three of the pans was completely burned out, there being sub-

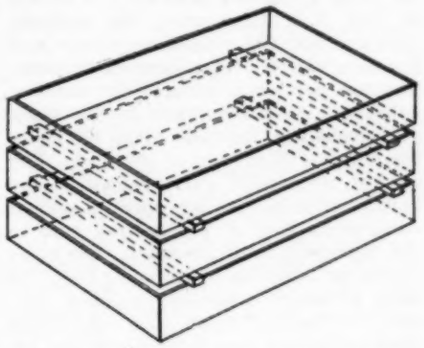


FIG. 1—ONE OF THE METHODS OF PILING PANS FOR BURNING SULPHUR

American Patents Issued October 23, 1923

The following numbers have been selected from the latest available issue of the *Official Gazette* of the United States Patent Office because they appear to have pertinent interest for *Chem. & Met.* readers. They will be studied later by *Chem. & Met.'s* staff, and those which, in our judgment, are most worthy will be published in abstract. It is recognized that we cannot always anticipate our readers' interests and accordingly this advance list is published for the benefit of those who may not care to await our judgment and synopsis.

1,471,332—Apparatus for Treating Liquids With Gases. William E. Greenawalt, Denver, Colo.

1,471,342—Means for Controlling Processes of Production. Lloyd Logan, Arlington, Mass.

1,471,347—Method of Making Grape Sugar. William B. Newkirk, Edgewater, N. J., assignor to Corn Products Refining Co.

1,471,401—Process for Desulphurization of Iron and Steel. Heinrich Koppers, Essen-Ruhr, Germany, assignor to the Koppers Development Corp., Pittsburgh, Pa.

1,471,410—Process of Making Waterproofing for Concrete and the Product Thereby Produced. Spencer B. Newberry, Cleveland, Ohio; Andrew W. Newberry, executor of said Spencer B. Newberry, deceased, assignor to Medusa Concrete Waterproofing Co., Cleveland.

1,471,421 — Process of Producing Porous Material. Mathias Ovrom Sem, Christiana, Norway, assignor to Det Norske Aktieselskab Elektrokemisk Industri, Christiania.

1,471,469—Method of Detinning Tin Scrap and the Like. Emanuel Kardos, Newark, N. J.

1,471,480—Means for Raising and Lowering Beater Rolls. Theodore D. Griley, Baltimore, Md.

1,471,513—Manufacture of Viscose Silk. Emile Bronnert, Mulhouse, France.

1,471,563—Carbonizing Compound and Process of Making and Using It. Stanley B. Mathewson and Walter K. Jamison, Springfield, Ohio, assignors to Walter K. Jamison, Stanley B. Mathewson, Howard F. Marston, Mrs. W. K. Jamison, and Mrs. S. B. Mathewson, trustees of the Lecar Carbon Co.

1,471,602—Dry Kiln. Joseph F. Hanrahan, Chicago, Ill.

1,471,619—Apparatus for Use in the Treatment of Pulverulent or Granular Materials With Glass. Richard Martin, Swansea, and John Isaac Richards, Ystalyfera, near Swansea, Wales.

1,471,641—Electrolytic Gas Cell. Clarence F. Adams, Dayton, Ohio.

1,471,645-7—Agglomerating or Cementing Granular Materials. Thomas M. Chance, Philadelphia, Pa.

1,471,661-2—Vacuum Pump. William Gibbons Houskeeper, New York, N. Y., assignor to Western Electric Co., Inc., New York.

1,471,711—Process for Obtaining Nitrite From Nitrous Fumes Produced in Electric-Arc Furnaces. Werner Siebert, Laufenburg, Aargau, Switzerland, assignor to Nitrun Aktiengesellschaft, Zurich, Switzerland.

1,471,718—Apparatus for Softening Water. Kent W. Bartlett, Hammond, Ind.

1,471,751—Process of Decomposing, Transposing, Dissolving, or Rendering Soluble Difficultly Soluble Bodies. Harry D. Rankin, Oakland, Calif., assignor of seven-tenths to Louis Sloss, San Francisco, Calif.

1,471,765—Evaporating Process and Apparatus. Robert E. Wilson, Cambridge, Mass.

1,471,792—Process for Applying Vitreous and Waterproofing Coating to Brick and Burnt-Clay Articles. Joseph H. Hines, Philadelphia, Pa.

1,471,807—Filter. James A. Roosevelt and Lloyd C. Roosevelt, San Antonio, Tex.

1,471,821—Method of and System for Utilizing Heat. Adalbert Besta and Heinrich Lent, Duisburg-Ruhrort, Germany.

1,471,832-3—Process of Separating the Constituents of Air and Other Gaseous Mixtures. Harvey N. Davis, Cambridge, Mass., assignor to Research Corporation, New York, N. Y.

1,471,854—Blue Sulphur Dye. Walter A. Manss, Wilmington, Del., assignor to E. I. du Pont de Nemours & Co., Wilmington.

1,471,875—Tunnel Kiln. Louis A. Witte; Elizabeth Witte, administratrix of said Louis A. Witte, deceased, Metuchen Borough, N. J.

1,471,926—Process of Recovering Byproducts From Gases Generated by the Dry Distillation of Combustibles. Josef Schäfer, Dortmund, Germany.

1,471,979—Manufacture of Nitrogenous Fertilizers and the Utilization of Nitrogen-Bearing Solutions. Eric Hannaford Richards and Henry Brougham Hutchinson, Harpenden, England.

1,472,011—Base-Exchange Silicate and Process of Preparing the Same. Yong K. Lee, Chicago, Ill., assignor to the Borromite Co. of America, Chicago.

Complete specifications of any United States patent may be obtained by remitting 10c. to the Commissioner of Patents, Washington, D. C.

stantially no residue in the upper pans, and only a very slight residue in the lower pan. In addition to the complete burning of the sulphur, the method enables the burning of a very considerably larger amount of sulphur (substantially three times) in a given period of time than by the method of burning sulphur in open receptacles.

The second of these two patents covers the form of apparatus illustrated in Fig. 2. This modification has been designed to conserve the heating effect of the molten sulphur and to insure concentration of the sulphur dioxide produced. A casing is used to surround a stack of pans such as shown in Fig. 3. This casing has suitable dampers for the admission of air and for observation of the burning sulphur. The top portion is utilized for melting sulphur. As the sulphur in the stock of pans burns, the heat given off melts the sulphur in the upper chamber. The conical, adjustable valve shown at the bottom of this chamber permits molten sulphur to flow at the desired rate to the topmost pan of the stack. The holes shown in the sides of the pans keep the level of molten, burning sulphur constant in each of them. An outlet flue with a suction fan is provided for removing the sulphur dioxide as fast as formed.

Electrolytic Tin

Addition of Sulphuric Acid and Sulphates Improves Character of Deposit

A patent granted Aug. 28 to Colin G. Fink of Yonkers, N. Y., describes a method for the electrolytic refining of tin which is giving excellent results in practical application. The principal improvements over the usual procedure in electrodeposition of tin consist in the addition to the bath of a definite concentration of sulphuric acid and of a sulphate of a metal more electropositive than tin, such as sodium, magnesium, iron or aluminum. This results in a firm, dense, finely crystalline deposit of tin, which makes it possible to turn out relatively thick cathodes without "treeing" and short-circuiting of electrodes. This method has in addition the advantages that the electrolyte has a relatively low cost, no artificial heating is required, no diaphragms are required, and the impurities in the anode tin such as antimony and bismuth form sludges that are easily removed. (1,466,126; assigned to Guggenheim Brothers.)

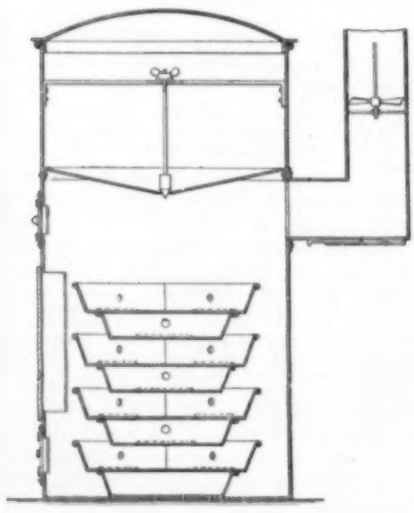


FIG. 2—SULPHUR BURNING PANS IN HOUSING

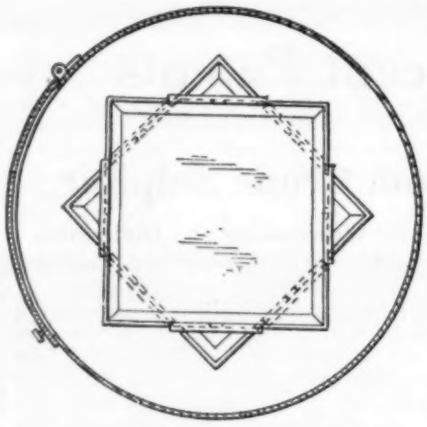


FIG. 3—SHAPE OF PAN AND METHOD OF PILING WHEN USING HOUSING

Electrical Cement

A Cement Which Will Set Cold Without Change in Volume and Is a Good Conductor

Alan P. Sullivan, of St. Marys, Pa., has developed an electrical cement which will set without heat, has considerable tensile strength, a low electrical resistance and a negligible coefficient of either expansion or contraction while setting. The primary purpose for which this cement is intended is for use in attaching pig-tails to electric brushes and the like, for by using the ingredients of the cement as a packing to surround the pig-tail after it has been inserted in the usual hole in the brush, it is possible to make a firm connection of very low resistance and to avoid the use of heat as in soldering or the use of any such pressure as is necessary to make the connection by riveting or similar methods.

The formula which has been found most satisfactory is as follows:

	Per Cent
Copper powder	83.8
Iron powder	8.4
Magnesium chloride	4.2
Magnesium oxide	2.5
Phosphoric anhydride	0.8
Ammonium chloride	0.3

The finely powdered ingredients are mixed together in a ball mill and provided they are not allowed to become moistened, will keep for a long time. When the cement is to be used it is mixed with about 5 per cent by weight of water and then should be applied promptly. It will be found to have set thoroughly in the course of a few hours. (1,468,930; assigned to the Stackpole Carbon Co.; Sept. 25, 1923.)

Calendar

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE, seventy-fifth anniversary meeting, University of Cincinnati, Cincinnati, Ohio, Dec. 27 to Jan. 2.

AMERICAN INSTITUTE OF CHEMICAL ENGINEERS, winter meeting, Washington, D. C., Dec. 5 to 8. Headquarters at the Willard Hotel.

AMERICAN PETROLEUM INSTITUTE, fourth annual meeting, Statler Hotel, St. Louis, Mo., Dec. 11 to 13.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS, annual meeting, New York City, Dec. 3 to 6.

AMERICAN SOCIETY OF REFRIGERATING ENGINEERS, annual convention, New York City, Dec. 3 to 5.

COAL MINING INSTITUTE OF AMERICA, annual meeting, Pittsburgh, Pa., Dec. 19 to 21.

FRANKLIN INSTITUTE, annual meeting, Philadelphia, Jan. 16, 1924.

NATIONAL ASSOCIATION OF PRACTICAL REFRIGERATION ENGINEERS, fourteenth annual convention, Memphis, Tenn., Dec. 12 to 16.

NATIONAL EXPOSITION OF POWER AND MECHANICAL ENGINEERING, Grand Central Palace, New York, Dec. 3 to 8.

PORTLAND CEMENT ASSOCIATION, New York, Nov. 19 to 21.

SOCIETY OF AUTOMOTIVE ENGINEERS, annual meeting, simultaneously with the Detroit Automobile Show, General Motors Bldg., Detroit, Mich., Jan. 22 to 25, 1924.

Books Received

Electrochemistry

ELEKTROCHEMIE WÄSSERIGER LÖSUNGEN. By *Dr. Fritz Foerster*, professor at the Technischen Hochschule in Dresden. Fourth edition. 900 pp., 185 illustrations. Leipzig: Johann Ambrosius Barth. Price: paper, 29 Swiss francs; bound, 33 Swiss francs.

Owing to the rapid exhaustion of the third edition, which appeared early in 1922, it has been necessary to publish the fourth edition of this standard work on electrochemistry with practically no revision of the text, except for the correction of a few minor typographical errors.

Petroleum Industry

HANDBOOK OF THE PETROLEUM INDUSTRY. By *David T. Day, Ph.D.*, editor-in-chief, in collaboration with fifteen contributors and associate editors. 2 volumes. 2,070 pages, illustrated. New York: John Wiley & Sons. Price, $15.

An immense amount of information on all phases of the petroleum industry has been made available for ready reference in this remarkable work. To gain a thorough comprehension of the scope of the work it is necessary only to study the chapter headings and consider that each has been prepared by a specialist. In brief, the treatment includes: Occurrence of petroleum; field methods in petroleum geology; oil-field development and petroleum production; statistics on petroleum and natural gas; transportation of petroleum products; characteristics of petroleum; petroleum testing methods; natural-gas gasoline; asphalt; oil shale; refining; cracking processes; use of fuel oils; internal combustion petroleum engines; lubrication; pipe standards; general tables, a

comprehensive glossary and an excellent index, which, it should be noted, is repeated at the end of each volume and not merely placed at the conclusion of the second volume, as is frequently the case. The broad scope and thorough treatment of this work make it of everyday interest to producers, refiners and users of petroleum products.

Statistics on Mineral Products

MINERAL INDUSTRY: ITS STATISTICS, TECHNOLOGY AND TRADE DURING 1922. Vol. XXXI. Edited by *G. A. Roush, M. S.*, and *Allison Butts*, in collaboration with forty-three specialists. 903 pages. New York: McGraw-Hill Book Co., 1923. Price, $12.

Because of its timeliness, this series is of interest not only to the technical man but also to the business man in search of current statistics on any mineral product, metallic or nonmetallic. As in previous years, the chapters include: Abrasives, aluminum and bauxite, antimony, arsenic, asbestos, asphalt, barium and strontium, bismuth, borax, bromine and iodine, cadmium, cement, chromium, coal and coke, cobalt, copper, cryolite, feldspar, fluorspar, fullers earth, gold and silver, graphite, gypsum, iron and steel, lead, magnesite, manganese, mica, molybdenum, monazite, nickel, petroleum and natural gas, phosphate rock, platinum, potash, precious stones, quicksilver, radium, selenium and tellurium, sodium salts, sulphur, pyrite and sulphuric acid, talc and soapstone, tin, titanium and zirconium, tungsten, uranium and vanadium, zinc.

Significance of H-Ion Data

DETERMINATION OF HYDROGEN IONS. By *W. Mansfield Clark, Ph.D.* Second edition, 480 pages, illustrated. Baltimore: Williams & Wilkins Co. Price, $5.

Many important changes will be found in the second edition of this well-known book. Certain chapters have been rewritten, all have been expanded to bring the book up to date and the excellent bibliography has been increased to nearly 2,000 references, covering over 100 pages. To any investigator in this field, the latter feature alone is worth many times the purchase price.

Filtration

INDUSTRIAL FILTRATION. By *Arthur Wright, M.E.* 336 pages, 135 illustrations. New York: Chemical Catalog Co. Price $5.

Literature in English covering the unit processes of chemical engineering has been lamentably meager, and it is accordingly a pleasure to note that this is only the first of a series, each volume of which will be devoted to a specific fundamental process.

It would be difficult to find a book better fitted to inaugurate such a series. Filtration, an operating problem in almost every chemical engineering industry, is treated in a way that brings out the best in present-day American practice by a man who has had extended specialized experience in this field. The author states that "the book's aim is to add a step to filter progress and this is attempted in two ways: (1) primarily by emphasizing the importance of mastering the fundamental laws underlying filtration and applying them in various ways; (2) by analysis of filter development through criticism of representative types of machines as a key to future progress.

"For purposes of ready comparison, each filter description in turn is reduced to a similar outline showing its development, operation, drawbacks, and the advantages which explain its basis of application to certain work. Discussion of drawbacks of each filter is included, not in the spirit of commercial criticism of patent features, but because it is plain that no one filter is applicable to all fields, and unless the limitations of each are understood, wrong selections may be made."

Operating men will be particularly interested in the author's practical suggestions as well as his frank discussion of available types of equipment.

Thorpe's Dictionary

DICTIONARY OF APPLIED CHEMISTRY. By *Sir Edward Thorpe*, assisted by eminent contributors. Vol. III. Explosives through K, 735 pp. Vol. IV, L to Oxydisilin, 740 pp. New York: Longmans, Green & Co. Price, each volume, $20.

Some of the more important subjects covered in these two volumes of the revised and enlarged edition of this standard work are as follows:

Vol. III. Explosives, extraction apparatus, feeding stuffs, fermentation, fertilizers, fuel, gas, glass, glycerine, gum resins, gums, hardened or hydrogenated oils, indigo, ink, ketones.

Vol. IV. Lakes, leather, matches, metallography, methyl compounds, naphthalene and derivatives, nitrogen fixation, essential oils, oils and fats, oxalic acid.

Treatise on Inorganic Chemistry

COMPREHENSIVE TREATISE ON INORGANIC AND THEORETICAL CHEMISTRY. By *J. W. Mellor.* Vol. III, Cu, Ag, Au, Ca, Sr, Ba, 927 pp., illustrated. New York: Longmans, Green & Co. Price, $20.

Copper, silver, gold and the alkaline earths are treated in the same detailed, yet readable, manner which has evoked such favorable comment for the previous volumes of this monumental series. The general order of discussion for each element is: history; occurrence; preparation, technical and academic; physical properties; chemical properties; atomic weight; oxides; fluorides; chlorides; bromides; iodides; sulphides; sulphates; carbonates; nitrates; phosphates.

General Chemistry

GENERAL CHEMISTRY, AN ELEMENTARY SURVEY. By *Horace G. Deming*, Professor of Chemistry, University of Nebraska. 604 pp. 5½x8¼, illustrated. John Wiley & Sons, Inc., New York. Price, $3.50.

An unusually well-illustrated text written to serve the needs of the beginner or of the graduate of a high school course in chemistry. Tables of questionable value are eliminated and an ample discussion of such up-to-date considerations as the electron theory, hydrogen-ion concentration, atomic structure and colloidal phenomona are included. Many mechanical aids to study are provided, among which are numbered sections, copious cross-references and graphical summaries at the ends of several chapters. One of the chief merits of the book is its flexibility, enabling, as it does, the teacher to teach what he wants to teach in the order in which he wants to present his material.

Applied Photography

PHOTOGRAPHY AS A SCIENTIFIC IMPLEMENT. A collective work by *A. E. Conrady, Charles R. Davidson, Charles R. Gibson, W. B. Hislop, F. C. V. Laws, J. H. G. Monypenny, H. Moss, Arthur S. Newman, George H. Rodman, S. E. Sheppard, W. L. F. Wastell, Wilfred Mark Webb* and *Colonel H. S. L. Winterbotham.* 539 pp., illustrated. D. Van Nostrand Co., New York. Price, $9.

The most definite advances in observational scientific investigation made in recent years have undoubtedly proceeded in many cases from the application of photography. The convenience, rapidity and exactness of scientific photographic methods have established this science firmly as a necessary aid to research in many fields, including microscopy, metallurgy, physics and engineering. The methods and technique employed in one field have frequently been hidden so deeply in the *Transactions* of the learned societies or in special publications that valuable data and methods have been practically inaccessible to workers in other fields. For the purpose of meeting the needs of such workers this book, each branch written by an expert, has been prepared. These branches include history, elementary optics, photographic optics, theory of processes and methods; applications to astronomy, physics, engineering and metallurgy, photomicrography, surveying, aëronautics, color work, printing; the technics of kinematography and the camera as a witness and detective.

A large degree of uniformity of treatment has been secured. The book undoubtedly has much of interest and value to the serious photographic worker.

Synthetic Resins

SYNTHETIC RESINS AND THEIR PLASTICS. By *Carleton Ellis.* 514 pages, illustrated. New York: Chemical Catalog Co., Inc. Price, $6.

To anyone who has not been closely in touch with recent developments in the field covered by this book, the wide variety of products discussed will be a distinct surprise. For in addition to a thorough treatment of those materials which first come to mind when synthetic resins are mentioned, such as coumaron resins and phenol-formaldehyde condensation products, there are chapters on the following types: Hydrocarbon; aldehyde; furfural; urea and thiourea; wood derivatives; hardened rosins and resinates; ester gums;

polybasic acid and polyhydric alcohol; vinyl group polymers; sulphur; nitro; halogenated rubber; miscellaneous. The last four chapters cover in detail the preparation of plastic molding compositions, the equipment and technique required for the production of the finished molded articles.

A most important feature of the whole book is the policy of directing attention to promising fields for further study and investigation.

Chemical Engineering Catalog

CHEMICAL ENGINEERING CATALOG. Eighth Annual edition, 1923. New York: Chemical Catalog Co., Inc.

This edition continues the presentation of classified and cataloged data in a form which has become thoroughly familiar to chemical engineers through the previous annual volumes.

Welding

CAST-IRON WELDING BY THE OXY-ACETYLENE PROCESS. Compiled by *T. C. Fetherston*, the Linde Air Products Co. Published by the company, 30 East 42nd St., New York City. 120 pages, profusely illustrated.

"The keynote of successful cast-iron welding is a thorough understanding of the necessity for adequate preheating, proper welding practices, and suitable annealing. In hundreds of shops and plants throughout the country the application of advanced methods in this work is resulting in truly remade castings, with consequent savings in money, labor and time. Many others, however, are daily confronted with what are considered difficult problems in the welding of cast iron. The solution of practically all of these problems lies in the proper application of the accepted practices as treated in this booklet."

This little volume promises to carry out splendidly the object thus stated in the foreword of the book. Chemical engineers having any type of repair and maintenance problems to which welding can be applied will do well not only to procure but also to study this book. The opportunities for prompt and satisfactory plant operation afforded through welding are far too numerous to be ignored by the successful plant man.

Molded Insulation

PLASTICS AND MOLDED ELECTRICAL INSULATION. By *Emile Hemming*. 314 pages, illustrated, New York: Chemical Catalog Co., Inc. Price, $5.

A broad definition of plastics is adopted in the first part of the book and the field is covered by chapters on: Ceramic products, calcareous cements and artificial stones, glass, casein products and plastics in road construction. An extended, classified list of patents concludes each chapter and there is also a separate section giving sundry patent references.

The second part of the book is devoted to the use of plastics for molded electrical insulation, the types in use being classified as: Hot-molded phenol-formaldehyde products; hot- and cold-molded organic and cold-molded inorganic compositions; ceramic materials; rubber compounds; organic plastics; laminated insulations.

Action of Chemicals on Materials

CHEMICAL RESISTANCE OF ENGINEERING MATERIALS. By *Marston L. Hamlin*, assistant professor of chemistry, Trinity College, and *Francis M. Turner, Jr.*, technical editor, "Chemical Engineering Catalog." 267 pages, illustrated. New York: Chemical Catalog Co. Price, $5.

Anyone who has had occasion to design chemical equipment or to seek the proper material of construction to be used for a given application will appreciate fully the need for just such a book as this. In the past it has been necessary to make a tedious search of the literature for such information as was not available in the private plant file, built up through years of experience. Now the material in the literature is available in a single volume and it is hoped that many of the data in private files may be incorporated in later editions.

Metallurgical Analysis

TECHNICAL METHODS IN ANALYSIS OF METALLURGICAL AND ALLIED PRODUCTS. By *Wilfred W. Scott, Sc. D.* 875 pages, illustrated. New York: D. Van Nostrand Co. Price, $6.

For the convenience of analysts dealing with metallurgical products, Professor Scott has prepared a volume similar in treatment to his well-known "Standard Methods of Chemical Analysis." All metallic elements and the pertinent non-metallic elements are treated in detail and there are additional chapters covering alloys, slags, fire assaying, coal, water and gas.

New Publications

THE UNIVERSITY OF OREGON has published a pamphlet on "The Classification of Carbon Compounds and Their Correlation With the Compounds of Other Elements," by Roger J. Williams.

"ANTI-FRICTION BEARINGS IN THE STEEL MILL," by A. M. MacCutcheon, which is a reprint of the Association of Iron and Steel Electrical Engineers, is available for free distribution by the Reliance Electric & Engineering Co., Cleveland, Ohio.

NEW BUREAU OF MINES PUBLICATIONS: Bull. 215, Timbering of Metal Mines, by E. A. Holbrook, Richard V. Ageton and Harry E. Tufft; Tech. Paper 316, Tests of a Powdered-Coal Plant, by Henry Kreisinger, John Blizard, C. E. Augustine and B. J. Cross.

NEW BUREAU OF STANDARDS PUBLICATIONS: Circular 58, Invar and Related Nickel Steels; Tech. Paper 239, Tests of Caustic Magnesia Made From Magnesite From Several Sources, by P. H. Bates, Roy N. Young and Paul Rapp.

THE BRITISH CAST IRON RESEARCH ASSOCIATION has issued its first quarterly "Bureau Bulletin." This little book will be of great value to any foundry metallurgist. It is published at the offices of the association, Central House, 75, New St., Birmingham, England.

Important Articles in Current Literature

More than fifty industrial, technical or scientific periodicals and trade papers are reviewed regularly by the staff of *Chem. & Met.* The articles listed below have been selected from these publications because they represent the most conspicuous themes in contemporary literature, and consequently should be of considerable interest to our readers. A brief résumé of each article is included in the reference given. Since it is frequently impossible to prepare a satisfactory abstract of an article, this list will enable our readers to keep abreast of current literature and direct their reading to advantage. The magazines reviewed have all been received within a fortnight of our publication date.

LES INDUSTRIES DU CUIR. La Preparation de la peau au tannage. *G. Marquat.* The second and concluding article of a series in which the progress of the leather industry in France is well covered. *La Technique Moderne*, Oct. 1, 1923, pp. 582-586.

COMMERICAL ALLOYS OF CHROMIUM AND IRON. *C. E. MacQuigg.* Physical properties, heat-treatment and structure of the 20 per cent and higher chromium mixtures. *Iron Age*, Oct. 18, 1923, pp. 1040-1041.

INDUSTRIAL USES OF HYDROGENATED OILS. *W. W. Myddleton.* A semi-popular account of the uses opening up for solid fats prepared by hydrogenating liquid oils. *Canadian Chemistry & Metallurgy*, October, 1923, pp. 251-252.

DIGESTION AND YIELD OF PULP. *Dr. B. Possaner.* Discussion of details of digestion processes for chemical pulp. Reactions and disturbances encountered. Advantages of direct and indirect heating of digesters. *Paper* (translation from *Zellstoffs und Papier*, June, 1923) Oct. 18, 1923, pp. 3-6.

HOW GOOD SILICA BRICK ARE MADE. *E. E. Ayars.* Preparation of raw materials is considered in this article, which is the first of a series to cover the industry in detail. *Brick & Clay Record.* Oct. 16, 1923, pp. 550-555.

THE MICROSCOPIC STRUCTURE OF SOAP. *Kenneth Maclennan.* An illustrated discussion of a method that appears to yield a peculiar insight into various soap properties. *J. Soc. Chem. Ind.*, Oct. 5, 1923, pp. 393T-401T.

A STUDY OF THE POSSIBLE COMPOSITION FOR THE NATIONAL FUEL OF FRANCE. *Ch. Legrand.* A physicochemical attack on the motor fuel problem as exemplified in alcohol-benzol-gasoline mixtures. *Chimie et Industrie*, September, 1923, pp. 411-28.

APPLICATIONS OF CHLORINE IN CELLULOSE FABRICATION. *Ardisson de Perdiguier.* Review of bleaching and extraction processes applicable to paper. *Chemie et Industrie*, September, 1923, pp. 429-36.

PRODUCTION AND USES OF FISH OILS. *Emile Andre. Chimie et Industrie.* September, 1923, pp. 437-52.

GRINDING TEMPERATURE OF WOODPULP. Effect of temperature on properties of mechanical woodpulp. What microscopic analyses of results at various temperatures shows. *Paper*, Oct. 25, 1923, pp. 3-7.

DEMPSTER-TOOGOOD VERTICAL RETORT INSTALLATION. A description of the official opening of the new plant of this type at Great Harwood, England, including a description of the oven construction. *Gas Journal* (London), Sept. 17, p. 847.

AUTOMATIC CONVEYING IN MATERIAL HANDLING. *L. S. Love.* A description of the application of various types of conveying equipment in such a way as to make handling automatic. *Iron Age*, Oct. 25, 1923, pp. 1105-1109.

FILTERING DIRTY GAS THROUGH FLUE DUST. *George B. Cramp.* A description of the method used by the Monessen plant of the Pittsburgh Steel Co. for dry cleaning blast-furnace gas. *Iron Age*, Oct. 25, 1923, pp. 1111-1114.

REGENERATIVE COAL GASIFICATION SYSTEM. *Morris W. Travers* and *F. W. Clarke.* A process for complete gasification of solid fuels. The article is to be continued in later issues of the same journal. *Gas Journal*, Oct. 3, p. 34.

CONSIDERATIONS RELATING TO THE FUTURE OF SULPHATE OF AMMONIA. *R. C. Taylor.* A paper urging conversion of ammonia in gas liquor to other forms more widely useful in fertilizer manufacture than is ammonium sulphate. *Gas Journal*, Oct. 3, p. 44.

Men in the Profession

ROBERT C. ANDERSON, chief chemist at the plant of the Chautauqua Worsted Mills, Jamestown, N. Y., was married Oct. 25 to Lucy Hugler.

Prof. W. L. BADGER of the University of Michigan delivered an address before the students in the Department of Chemical Engineering at Rensselaer Polytechnic Institute, Oct. 25, on "Evaporator Design."

W. T. BALL has been appointed assistant superintendent at the Longmont, Colo., plant of the Great Western Sugar Co., to succeed V. L. AIKEN, who has been transferred to the main office at Denver.

Dr. F. M. BECKET, metallurgist and director of the Union Carbide & Carbon Research Laboratories, Inc., has been selected to receive the Perkin medal for 1923. Presentation will be made at the January, 1924, meeting of the American Section of the Society of Chemical Industry.

FRANK J. DOWNEY, JR., of Baltimore, Md., has accepted a position as chief chemist at the Sugar City, Utah, plant of the Utah-Idaho Sugar Co.

J. FRANK ELLIS has been appointed general superintendent of the Amalgamated Sugar Co., Ogden, Utah, succeeding H. A. BENNING, resigned.

BURTON A. FORD has been selected secretary and general manager of the National Lime Association. This action took place at a regular meeting of the board of directors, held in Chicago, Oct. 11, 1923. For the past 3 months Mr. Ford has been acting secretary of the association, having been appointed to that position at the annual convention last June. He is a graduate of the University of Maryland, and until the summer of 1922 was with the Virginia-Carolina Chemical Co. in the capacity of division manager and was also secretary-treasurer of the Bryant Fertilizer Co. In the summer of 1922 he became assistant to W. R. Phillips, who was then general manager of the National Lime Association.

Prof. CRAIG HOYT of the faculty of the Grove City College, Grove City, Pa., has been acting in the capacity of court chemist, as expert witness in a number of local cases.

GRINNELL JONES of the division of chemistry, Harvard University, has returned to Cambridge from Washington, where since July he has been assisting the Chemical Division of the U. S. Tariff Commission.

DANA H. KELSEY, vice-president of the Prairie Oil & Gas Co., has been elected president of the Kasoming Oil Co. and the Bair Oil Co., Cheyenne, Wyo., affiliated organizations, to succeed W. S. FITZPATRICK, resigned. A. G. DANA has been elected vice-president and general manager of the two last-noted companies, to succeed H. H. MADDERN, resigned.

GUY LEONARD, manager of the American Cellulose & Chemical Co., Amcelle, near Cumberland, Md., has resigned, and will be succeeded by ARTHUR J. FITCH, heretofore works manager for the company at its plant at Darby, England.

BENNO LOWY, of San Francisco, Calif., a chemist who is associated with the Pacific Chemical Laboratories, has been reappointed official chemist of the New York Produce Exchange for the Pacific Coast territory and the Orient.

Sir NEWTON MOORE, member of the executive committee of the British Empire Steel Corporation, who has been in Canada for some months in connection with the reorganization plans being carried out by President Wolvin, has sailed for England.

Prof. W. H. PERKIN of Oxford University has been appointed to the headquarters research staff of the British Dyestuffs Corporation. It is not stated if Professor Perkin will leave Oxford, but presumably not.

CHARLES M. SCHWAB, chairman of the board of directors, Bethlehem Steel Corporation, Bethlehem, Pa., will be the guest of honor at a testimonial dinner to be given by the Engineers' Club, Philadelphia, Pa., at the Bellevue-Stratford Hotel, Nov. 20, commemorating his election as an honorary member of the club, an event which takes place usually only once in 15 years.

HAROLD STOSE, who has in the past been connected with the Research Laboratory of Applied Chemistry at the Massachusetts Institute of Technology, has recently severed his connection there to take up work with the Hood Rubber Co. at Watertown, Mass., in the chemical department.

BRADLEY STOUGHTON, metallurgist, gave an interesting address on the subject of "Heat-Treatment of Cast Iron" before the members of the Lehigh Valley Engineers' Club and the American Society for Steel Treating, in joint session in the physics lecture room, Lehigh University, Bethlehem, Pa., Oct. 19. The paper was illustrated with a number of lantern slides.

Dr. W. LEE TANNER, research chemist of the Grasselli Chemical Co., is now engaged in field experiments for the chemical control of citrus tree pests at Panasoffkee, Fla.

CHARLES P. TOLMAN has resigned as chief engineer and chairman of the manufacturing committee of the National Lead Co., which position he has held for 16 years, to go into general consulting practice, specializing in dust and fume control, handling materials and products and in manufacturing methods and processes particularly. His new office is in the same building as the National Lead Co., 111 Broadway, New York City, and he will continue as consulting engineer for the company.

W. O. WHALEY, chief chemist for a number of years at the Penick & Ford Production Laboratories, New Orleans, La., has resigned to become connected with the local branch of the United States Industrial Alcohol Co. in a similar capacity. He has been active as a member of the local division of the American Chemical Society.

Obituary

Dr. SERGIO BAGNARA died from the effects of cyanide poisoning at the plant of the California Cyanide Co., Huntington Park, Los Angeles, on Sept. 26. Dr. Bagnara, who was engaged on experimental work in the laboratory, accidentally sucked a small amount of weak cyanide solution into his mouth through a pipette. The danger of poisoning was probably slight, but to avert any ill effects he afterward drank as an antidote some liquid in a bottle in front of him that was labeled hydrogen peroxide. The bottle, however, contained a strong solution of calcium cyanide, and a fatal effect was almost instantaneous. The coroner's jury returned a verdict of accidental death.

WILLIAM M. HOFFMAN, well-known inventor, died at his home, 25 Gallatin Ave., Buffalo, Oct. 17, at the age of 71 years. At the time of his death Mr. Hoffman was chief engineer for the Schoellkopf sheep tanneries. Mr. Hoffman was the inventor of several tanning machines now in use, a brake-shoe, a gravity feed oil burner and other articles. He was awarded honorable mention in 1914 by the Encyclopedia Americana for his efforts in developing the rotary engine. Early in the world war Mr. Hoffman entered the service of the British Government to help speed up the ammunition production.

WILLIAM THOMSON, a well-known consulting chemist and analyst of England, died suddenly in his laboratory in Manchester, Oct. 4, aged 72.

ARTHUR L. STARK, 55, of Elyria, Ohio, who was general superintendent of the Harshaw, Fuller & Goodwin Co. of Elyria, Brooklyn and Philadelphia, died at his home on Oct. 18, after an illness of 2 years. Mr. Stark was a graduate of the Case School of Applied Science, Cleveland, and had contributed several inventions to the chemical industry during his 25 years in that business.

News of the Industry

Summary of the Week

Sweden develops new sulphite distillate which may prove serious competitor of imported gasoline.

Reports from Germany indicate a marked scarcity of phosphate.

Shipments of nitrate of soda from Chile for the present fiscal year expected to exceed those of last year by 1,000,000 tons.

Association of British Chemical Manufacturers is extending research work in chemicals.

Freight rates on caustic soda from Niagara Falls to New York are declared unjust and preferential.

Late demand for calcium arsenate has reduced stocks in sellers' hands.

Further reductions in quotations for bleaching powder demonstrate that the price war has not yet run its course.

Chemical Foundation files final brief in government's suit to annul sale of German patents. Judge Morris' decision not expected for several weeks.

Inquiry started to ascertain possible undeveloped uses of silver in industry and commerce.

Canadian lignite utilization plant closes down.

Larger Distribution of Chemicals and Allied Products in October

Less-Than-Capacity Operations of Textile, Paper and Tanning Trades Restrict Increase in Buying of Chemicals—Important Chemicals Offered at Lower Price Levels

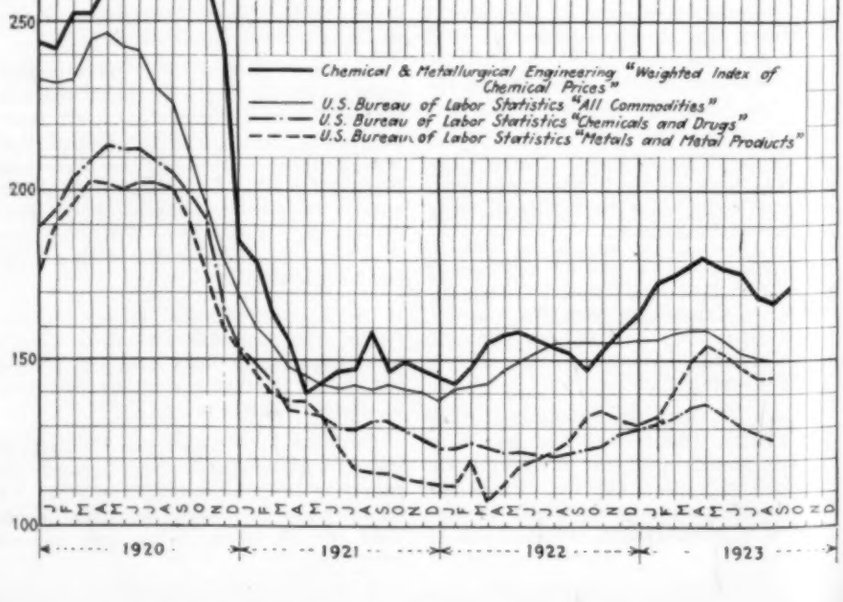
CONSUMING industries were more active in October than in the months immediately preceding. Hence buying and consumption of chemicals and kindred commodities were on a wider scale, but underproduction was reported in some lines, notably textile, tanning and paper, and this prevented real activity in the materials markets. Buying for export has gone ahead steadily and the outward movement of chemicals for the first 10 months of the year has been larger than in the corresponding period of 1922.

The weighted index number of *Chem. & Met.* settled at 166.80 for the month, which compares with 172.08 for September and 167.86 for August. This places the index number at the lowest level of the year and plainly shows that trend of values for chemicals has been downward. Such important chemicals as soda ash, caustic soda and bleaching powder were leaders in the downward price movement. In the case of bleaching powder values were affected by ruinous competition on the part of sellers, but soda ash and caustic soda were marked down under the influence of lower producing costs and because makers were eager to extend sales, especially in foreign markets.

Imports continued to hold up in volume and a varied line of foreign-made chemicals was competing in our markets. In some cases domestic sellers meet the levels of the imported grades and in other cases there is a wide differential between prices for foreign and domestic selections.

Contract prices for 1924 deliveries were announced during the month in the case of many items and trading was featured by a decided increase in the amount of forward business placed. In nearly every case the newly established prices for contracts were more favorable to buyers than were the quotations which they replaced. In general these quotations were predicated on lowered costs of raw materials, but in a few instances selling pressure was mainly responsible for the decline, and stability in price was lacking where competitive selling invited trading at private terms.

The trend of prices covering 404 commodities or price series as given by the statistics of the Bureau of Labor was upward during September. The weighted number rose from 150 in August to 154 in September, an advance of nearly 2¾ per cent. Chemicals and drugs stood at 127 in August and advanced to 128 in September. The corresponding figures for metals and metal products were 145 and 144.



News in Brief

The Nobel prize for outstanding achievement in medicine during the past year has been awarded to Dr. F. G. Banting and his mentor, Dr. J. J. R. McLeod, both of the University of Toronto. These are the men who have discovered insulin and so made possible control of diabetes.

White arsenic was the most important item in production of non-metallic minerals throughout Canada during 1922, according to a statement issued by the Bureau of Statistics. The quantity turned out last year was 2,576 tons, with a value of $321,037, compared with 1,085 during the previous year.

To destroy poison ivy and other noxious weeds an emulsion is to be made by the Taylor Chemical Co., PennYan, N. Y. An enlargement of the plant has been made by this company and equipment for the new manufacture is now being installed.

Great Britain's largest student metallurgical society, located at the University of Birmingham, numbering among its members about twenty outside research men, is seeking to build up a reference library. To this end the librarian has sent out a request that books, trade catalogs and other metallurgical literature be sent to the university to be placed on file in this collection.

Increased cement production is planned by the Petoskey Portland Cement Co., Petoskey, Mich. Its plant is now running on a basis of about 2,500 bbl. per day, with full working force. New kilns and other facilities will be provided to allow for a maximum of 4,500 bbl. daily, with employment of additional operatives in practically all departments. A new power house will also be constructed.

Late Buying Reduces Stocks of Calcium Arsenate

Stocks of calcium arsenate have been reduced at an unexpected rate during the latter part of the cotton-growing season, in contrast with comparatively light early purchases of the poison. The slowness with which stocks began to move early in the season alarmed the producers of white arsenic and the manufacturers of calcium arsenate, it is stated, with the result that their operations were curtailed. With the heavy losses of 1922 still in mind, many came to the conclusion that the saturation point had been reached. Instead it has proved that the heavy buying did not start as early this year as usual.

That situation in addition to faulty distribution of the material produced a scramble for existing stocks in certain sections. It is very apparent that the demand for calcium arsenate will continue to be in excess of the supply during the coming season. To meet this situation, it is probable that the arsenic committee will be called together soon.

Fall Meeting of Paper Men in Wisconsin

Report on Use of Decayed Wood—Heat Losses and Material Handling Receive Attention

The report of the committee on waste was the main feature of the fall meeting of the Technical Association of the Pulp and Paper Industry. The meeting, held in Appleton, Wis., Oct. 25 to 27, was well attended. The Cost Association of the Pulp and Paper Industry and the Northwestern Division of the Pulp and Paper Mill Superintendents Association also met in Appleton at this same time. The superintendents discussed the same general problems in connection with drying and elimination of sulphite waste, although the technical sessions of the two organizations were held independently. A combined banquet was held for both groups on Friday evening. On Saturday morning a trip was made through the plant of the Kimberly Clark mill, in which sulphite-groundwood paper is made, especially for use in rotogravure work. This trip was followed by a luncheon to the visitors at the mill.

The report on waste was in the nature of a summary of progress made since the spring meeting held last April in New York. This committee has had under consideration during the past year the elimination of white water or fiber losses, utilization of bark and the elimination of broke in the mill. In addition three new lines of work have been carried on during the past few months—the checking up of heat losses and the factors governing them, the use of decayed wood in pulp production and the general improvement of material handling methods in the mill.

Solving the Industry's Problems

Since the first three problems were very nearly finished in the spring, the major part of the recent meeting was devoted to a consideration of the newer work. In attacking the problem of heat, pulp and paper mill boiler house practice was studied and the various points of inefficiency indicated. It was pointed out in considering sulphite pulp mills that the Decker process may partly answer the very large losses of heat which have been usual in the digesters. The heat leaving the machine room was shown to be the most serious loss from the paper mill proper.

In attacking the material handling problem the various types of equipment were first classified, it being shown that practically every available means for transporting materials is required at some point in the process. Definite recommendations for taking care of ashes, limestone and sulphur, pulpwood and logs, wood chips, rags and old stock, pulp slush and finished pulp were made.

One of the most interesting phases of the report was that on the utilization of the wood that has been attacked by fungi. It was indicated that the results of tests at the Forest Products Laboratory would show much wood that has previously been left standing as useless may be utilized by the sulphite method with results commercially practicable. This was considered an important finding, although it was brought out that the report was an informal one and final results could not be reported until the spring meeting, to be held in New York next April.

The committee making this report on waste is composed of R. B. Wolf, chairman; G. D. Bearce, vice-chairman; W. G. MacNaughton, secretary; O. L. Berger, H. P. Carruth, P. K. Fletcher, H. H. Hanson, F. R. Hyatt, H. O. Keay, Ernst Mahler, F. J. Morrison, H. F. Obermanns, J. E. Plumstead, R. B. Robertson, J. D. Rue and H. S. Taylor.

Lignite Carbonizing Plant Lies Idle in Canada

The costly building erected at Bienfait, Sask., with money furnished by the governments of Manitoba, Saskatchewan and the Dominion of Canada, so that the Lignite Utilization Board might demonstrate to the coal operators of Canada the most economical method of carbonizing and briquetting the Souris lignite coal, is now practically idle. Only the crushers, elevators, power plant and byproducts machinery are working. The expensive and huge batteries of six costly carbonizing retorts are being dismantled. The drying ovens are cold and the briquetting machines are rusting.

For the time being the carbonized char at the plant will be shipped to Hebron, N. D., to the experimenting briquetting plant there, and the briquets will be given a thorough test by commercial plants and private individuals throughout Saskatchewan and Manitoba.

Engineers and technical men attending the Western meeting of the Canadian Institute of Mining and Metallurgy in Estevan, Sask., Oct. 3 to 5, spent considerable time in inspecting the carbonizing process, and were practically unanimous in their conclusions that the Hood-Odell process provides all the necessary requirements for successfully carbonizing lignite. The oven was economical to construct, could be operated with unskilled labor, and a considerable quantity of the byproducts, such as gas, tar and ammonia, could be saved.

Lehigh Chemists Hear Kendall

The regular monthly meeting of the Lehigh Valley Section of the American Chemical Society was held in the Pardee Auditorium of Lafayette College, Easton, Pa., on Oct. 26. The principal address was made by Dr. James Kendall, professor of chemistry, Columbia University, on the subject of "Isotopes," which proved highly interesting to those assembled. During the course of the evening, motion pictures were shown, covering a "Journey Through Filmland," first exhibited at the Rochester meeting of the parent society.

Washington News

Scarcity of Phosphates in Germany

German soil is in great need of phosphates. This need will continue to increase, and an appeal has been made to the German chemical industry to make available phosphates in the form of P_2O_5, at prices which will permit of general use.

Advices from Germany to the Department of Commerce are to the effect that this point was brought prominently to the attention of German chemists during the course of a recent meeting at Jena. German soil also is in great need of nitrogen. No less than 500,000 tons of this material should be used annually, it is estimated. The total German production of nitrogen at this time is less than 350,000 tons.

Before the war, 650,000 tons of P_2O_5 was applied annually, but only 150,000 tons is available for the 1924 crops.

Freight Rates on Caustic Soda Judged Unduly Preferential

Rates on caustic soda, in carloads, from Niagara Falls to New York City and to other points taking New York rates, as well as to points south of Baltimore, have been found to be prejudicial and unduly preferential to the competitors of the Hooker Electrochemical Co. at Niagara Falls. These rates were attacked by the Hooker company, which contended that the spread between the rate from Niagara Falls to New York and the rate from Solvay to New York was greater than the differences in transportation conditions warrant. The commission has sustained the contention of the Hooker company and has ruled that the difference in the rate in the future must not exceed 3.5 cents.

Chemical Industry Reported Net Income of $18,108,538 for 1921

Corporation returns to the Bureau of Internal Revenue show that 356,397 concerns made tax returns in 1921. Of that number, 171,239 had a net income of $4,336,047,813. On that amount they paid a total tax of $701,575,432. There were, however, 185,158 of the corporations reporting that had deficits rather than income. The aggregate of those deficits was $3,878,219,134. Details for the chemical and allied industries show the following:

	No. of Corporations	Net Income	Total Tax
Chemicals and allied substances	912	$18,108,538	$3,421,329
Chemicals proper:			
Paints and varnishes	664	7,591,201	1,217,053
Oils, vegetable and animal	394	2,723,303	330,531
Petroleum and mineral oil	420	51,613,827	7,115,536
Soaps	161	4,456,414	989,293
Fertilizers	229	1,122,663	154,309
All other	3,144	72,601,343	16,369,811
Total	5,924	$158,217,289	$29,597,862

Vermilion Industry of Hongkong

One of the oldest of the Hongkong industries is the manufacture of vermilion, which is used by the Chinese for making varnishes, for coloring candles and paper and for stamping and writing purposes. In a report from Hongkong, Consul LeRoy Webber states that the annual output in Hongkong is estimated to be about 20,000 cases of 50 catties each (66⅔ lb.). Of the total output, about 10 per cent is for local use, 10 per cent for exportation to the United States and Europe, and 80 per cent for exportation to Canton, Fatshan and the neighboring districts. Exports to the United States and Europe are small in consequence of the competition of coal-tar dyes, which are much cheaper.

There is only one grade of Chinese vermilion, made of a mixture of mercury and red sulphur in the proportion of 100 to 90; that is, 100 lb. of mercury to 90 lb. of red sulphur. The red sulphur employed is secured from the nearby provinces of South China.

About 20,000 flasks of mercury are annually used in the vermilion industry in Hongkong. The present local market price of mercury is 150 Hongkong dollars per picul.

To Survey Possible Uses of Silver in Industry

Secretary of the Interior Work has recently asked the Bureau of Mines to make a preliminary survey of possible new uses for silver in commerce and industry. If the preliminary study looks sufficiently promising, it was stated, definite research may be undertaken.

With the decrease in the demand for silver for monetary purposes following the expiration of the Pittman act, silver producers are faced with the necessity of finding new markets for their metal, Secretary Work has pointed out, and this new study has been ordered for the particular purpose of determining where the use of silver might be introduced into hitherto unsuspected fields. It is expected that the Bureau of Mines will submit a preliminary report to Secretary Work within a few days.

"In connection with the present interest in the future of silver, it has occurred to me that a careful study might show important fields for increased use of the metal in commerce and industry," Secretary Work wrote in his letter to the Bureau of Mines. "If a sufficient use to offset the decrease in its demand for monetary purposes can be found, it will be of large national importance. May it not be substituted to advantage for other metals or materials in certain uses? What other possibilities exist? The United States has long been the premier producer of silver, and if there are any such undeveloped fields for its utilization, it would seem proper that this country take the lead in discovering and exploiting them."

German Potash Production Meets With Difficulties

Potash production in Germany, as well as the nitrogen fertilizer industry, is being conducted in the face of a multitude of difficulties, but recent reports to the Department of Commerce indicate that none of them is comparable, in magnitude, to those represented by labor troubles and the price of coal. The wage demands of the men are said to be beyond the ability of these industries to pay. While the workmen disclaim any intention of demanding more than the industries can afford to pay them, there are so many uncertain elements in cost accounting and estimates of living expenses that accurate figures cannot be compiled.

The most important recent development in the German fertilizer situation is the amalgamation of the agricultural bank and the powerful fertilizer concern of Kali Werke Ummendorf-Eisleben.

Mixture of Cresylic Acid and Coal-Tar Pitch on Free List

The Treasury Department has ruled that a mixture of cresylic acid and coal-tar pitch, which on distillation yields less than 5 per cent of tar acids in the portion distilling below 190 deg. C. and less than 75 per cent tar acids in the portion distilling below 215 deg. C., is entitled to customs entry free of duty under paragraph 1549 of the 1922 tariff act. Previously, unmixed cresylic acid had been declared dutiable under paragraph 27 of the act as a distillate. The decision as to the mixture is based upon the ground that both cresylic acid and coal-tar pitch are specifically mentioned in paragraph 1549 of the free list and not in paragraph 27 of the dutiable list.

F.T.C. Order Against Soap Makers

The Crofts & Read Co. and the Polonia Soap Co. of Chicago, manufacturers of soaps and toilet articles, have been served by the Federal Trade Commission with an order to cease and desist using misleading designations on brands and labels of soap offered for sale. The order prohibits the use of the terms medicinal, peroxide, buttermilk or witch hazel on wrappers or containers when the soap contains none of the materials specified.

Safeguarding of Industries Act Develops British Dye Trade

Association of Chemical Manufacturers Responsible for Its Enactment—Now Extending Research Work in Chemicals

WITH a capital of less than £100, the Association of British Chemical Manufacturers has been the wedge which opened the way for the safeguarding and the profitable employing of the £100,000,000 invested during the war in 268 chemical enterprises. This organization has made it possible for diverse interests to present a united front. It is mainly responsible for the safeguarding of industries act, without which the war-time chemical industry could not have been saved. The association has promoted research. It has brought about revolutionary betterments in the technical organization of most of its member companies. It has kept abreast with chemical progress throughout the world, and has made it possible for its members to profit from the experience of others. It has been recognized formally by the government as representative of the entire industry.

Great Britain always has been a leader in research. Perkin, in 1856, did the research which the Germans applied and from which they built up one of the most profitable industrial structures ever created. Those who are capable of conducting pure research usually are indifferent to its commercial application. The Association of British Chemical Manufacturers is seeing to it that no further opportunities escape. It is seeing to it that scientific developments are applied. It is encouraging the British bent toward pure science.

Research Growing in Britain

More research is in progress in Great Britain than ever before. Each step of such endeavors on the part of scientists is being scrutinized closely by those who have an aptitude for application. Now that a few years have been had during which the essential practice of processes could be carried on, the chemical manufacturers of the United Kingdom feel that they have reached the point where they can enter world competition on an equal footing with the older German industry.

Unquestionably the greatest single accomplishment of the Association of British Chemical Manufacturers was in connection with the enactment of the safeguarding of industries act. This act has been in force for 3 years. It provides a licensing system along the lines of that desired by the American chemical industry, but which was defeated at the last session of Congress.

The British act is administered by the Board of Trade. The law provides for two committees to act in an advisory capacity to the board. As a matter of fact, the committees do the actual administration of the act. The licensing committee is composed of five representatives of the consumers of dyes, three representatives of the manufacturers and three persons who have no connection with the use or production of dyes. The committee has two technical advisers, one of whom represents the consumers and one the manufacturers. All applications for the importation of foreign dyes go first to these technical advisers. If each of them agrees that there is no suitable British equivalent, a license is forthcoming at once. If each is convinced that there is a British equivalent, the license is refused without delay. The right of appeal exists and any applicant may carry his case before the licensing committee. If the technical advisers do not agree, the application then goes to the committee. While there has been some delay occasioned by the lack of suitable laboratory facilities to carry out tests when decisions depend upon chemical analyses, the machinery as a whole has functioned very efficiently and no great amount of protest is heard from the users of dyes.

German Agents Bitter

Agents representing German manufacturers are particularly bitter against the practice which puts the British dyemaker in direct touch with the consumer. The burden of proof that the British-made dyestuff is equivalent to that made in Germany rests upon the dye-maker. In order that the British manufacturer may demonstrate the equal value of his dye, he must be put in actual touch with the consumer. In most cases it is not difficult for the British maker to convince the British consumer that his product is the equivalent of the foreign-made article, if in fact it possesses equal merit. The British textile manufacturers and other users of dyes have about reached the point where they realize that a domestic dye industry is necessary to prevent their being at the mercy of a foreign monopoly. There still are some who would do away with the licensing system, but the volume of objection has been reduced very greatly.

The Association of British Chemical Manufacturers is not content to rest on the laurels which it won by securing the safeguarding of industries law. It is keeping busy with the numerous problems of the twelve groups into which it is divided. The interests of these groups vary widely. They frequently are in conflict, one with another. Each group makes its own recommendations, which go to a representative council. It is this council that harmonizes the conflicts and keeps the energies of the groups directed in constructive channels, rather than having them expended in internecine strife.

The groups into which the association is divided are as follows: Group 1, R. M. Bewick, the United Alkali Co., Ltd., chairman—Acids (including acetic and oxalic), carbonic acid, hydrogen, oxygen and gases, alum, chrome, zinc, copper and iron compounds, fertilizers (including superphosphates); Group 2, J. H. Gold, Brunner Mond & Co., chairman—Alkalis, cyanides, chlorine and compounds, slicates, chlorates, borax, hydrogen peroxide, magnesia compounds (not medicinal); Group 3, A. Ross Mitchell, Joseph Watson & Sons, chairman—Fats, greases, waxes, resins, glycerine, soap; Group 4, chairmanship vacant—Gelatin, glue, varnishes, paints, polishes, tanning; Group 5, S. A. Sadler, Sadler & Co., chairman—Coal-tar primary products, excluding ammonia and ammonia products; Group 6, C. A. Hill, British Drug Houses, Ltd., chairman—Fine chemicals (analytical, pharmaceutical, photographic), rare earths, synthetic essences and perfumes, alcohol derivitives and ethers; Group 7, D. Owen-Evans, Mond Nickel Co., chairman—Phosphorus, manganese, potassium, sodium, barium, calcium, cadmium, lead, arsenic, antimony, tungsten, molybdenum; Group 8, chairmanship vacant—Cellulose products (including paper), celluloid, rubber and substitutes; Group 9, W. H. Dawson, British Alizarine Co., chairman—Explosives, dyes and intermediates; Group 10, chairmanship vacant—Glass, porcelain, pottery, refractory materials, lime, cement, chemical-resisting materials; Group 9, Thorp Whitaker, Bradford Dyers' Association, chairman—Allied industries; Group 12, G. C. Parnaby, South Metropolitan Gas Co., chairman—Distillation of coal, shale, oils and wood; acetone, ammonia and ammonia products, charcoal and fuels.

Just at this time the association is much concerned with the preparations for an exhibit at the British Empire Exhibition of which the chemical industry can be proud. The maximum amount of space that could be allotted to the chemical industry at that exhibition was subscribed 113 times over. The association, however, will allot the space in a way that will bring out prominently the progress which has been made since 1914.

Novel Organization to Promote Glass and Pottery

A new organization, to be known as the Associated Glass and Pottery Manufacturers, is being organized at Pittsburgh, Pa., and application for a state charter has been approved. The organization has been formed to "encourage and protect trade and commerce in glassware and pottery by holding public exhibitions of such products from time to time, and educating the public in the usefulness of same." The incorporation charter has been taken out in the names of Charles H. West, D. Harry Cushwa, Earle Wesson, Harry A. Ross, Kirk R. Bryce and others. The association is represented by Reed, Smith, Shaw & McClay, 747 Union Trust Bldg., Pittsburgh, attorneys.

Reduced Outputs Reported Throughout German Chemical Industry

Potash Trade in Precarious Position—Phosphate Shortage Since the War—Caustic Soda Imported to Make Up Domestic Deficiency

IN a report from Assistant Trade Commissioner W. T. Daugherty it is stated that the domestic production of ammonia and chemical fertilizer salts in Germany by the Haber-Bosch process of atmospheric fixation is entirely inadequate for feeding Germany's soil. With the Oppau nitrogen-fixation plant closed down and the Leunawerke at Merseburg working presumably at capacity, the production of a maximum of 145,000 tons of nitrogen content annually is but 29 per cent of Germany's alleged need of nitrogen in synthetic fertilizer, which is 500,000 tons annually, as estimated by Geheimrat Caro, co-inventor of the Frank-Caro process of calcium-cyanamide manufacture and head of the Bavarian Nitrogen Works at Trostberg. The Leunawerke is located on lignite deposits, of which it consumes about 5,000 tons daily, which make it independent of coal from elsewhere.

Calcium Cyanamide—Calcium cyanamide works at Piesteritz and Trostberg are in unoccupied territory and are producing actively. The supplementary production of nitrogen by the calcium cyanamide plants and the coke and gas works is not important in meeting the demand. The chief producers among coke and gas plants are located in the Ruhr and are now scarcely operating. Calcium cyanamide, moreover, is used but little as a fertilizer. It must also be remembered that industry as well as agriculture absorbs a considerable part of the production of these synthetic nitrogenous salts.

Ammonium Sulphate — Ammonium sulphate byproduct from coke and gas plants (85 per cent from coke and 15 per cent from gas plants) is short on account of the major production being centered in occupied territory, although the coke plants left to Germany after the partition of Upper Silesia are operating.

Chilean Saltpeter — Imports of Chilean saltpeter offset but slightly the underproduction. Only 8,815 tons of Chilean saltpeter (or 1,410 tons nitrogen content) were imported in the first 6 months of 1923, against 19,764 tons (3,162 tons nitrogen) in the corresponding period of 1922. These figures compare with an average of 387,159 tons (or 61,945 tons nitrogen) in the first 6 months of 1913, before air fixation had become anything like an important industry in Germany.

Phosphates and Organic Nitrogeneous Fertilizers — Conservation of all available supplies of phosphates, derived mainly from Thomas slag, as well as organic nitrogenous fertilizers, is likewise reflected in the revised list of export prohibitions. The phosphate shortage has been particularly marked in Germany since the outbreak of the war. Importation of Florida phosphates is limited by inability to pay in dollar currency.

Soda Ash—Germany, although potentially self-contained in the manufacture of soda ash, has had to rely to some extent on imports in post-war years on account of increased local consumption as well as a somewhat decreased production resulting from the coal shortage, transportation facilities and other factors. Soda ash plants, some of which are in occupied territory, are reported to be producing at the rate of about 25,000 tons monthly, which seems to be sufficient for temporary domestic needs so long as occupation continues. Imports, which in the first half of 1923, relatively speaking, were considerable, are now negligible.

Caustic Soda—Caustic soda is essentially a potential import commodity and will doubtlessly remain so longer than will soda ash. The present domestic production at the rate of 2,500 tons monthly, against a capacity production of around 4,000 tons monthly, is inadequate, ordinarily, to cover the local needs of the fixed nitrogen, aluminum, glass and soap industries. Germany needs its local supply and therefore finds it necessary to include these products on the export prohibition list. Local consumption has decreased and imports have fallen off, owing to abnormal conditions.

Sulphuric Acid—Of the sulphuric acid produced, 50 per cent is located in occupied territory, as is most of the native pyrites for raw material, while the next production area—Upper Silesia—is said to have lost a potential annual output of 256,000 tons of sulphuric acid (calculated at 50 deg.) when this section was partitioned. Germany must permanently import pyrites for its manufacture of sulphuric acid.

Potash and Potash Salts—Reduction and refining plants derive their raw material supply from Germany's extensive potash mines, and are able to cover local as well as present world needs. The industry is at present forced to work at far less than capacity on account of virtual cessation of local orders, as well as a falling off of foreign orders.

The potash industry, with its allied branches of manufacture, is now in a very precarious position. There are virtually no domestic sales of fertilizer, while the chemical and pharmaceutical branches are consuming in very limited quantity. Foreign sales are not overencouraging and it is reported that foreign countries like Italy are complaining that German prices are too high.

Trade Notes

The receivership recently arranged for the Warren Chemical Co. of Newark, N. J., has been dismissed.

The value of exports of gum copal from the Belgian Congo during 1920 was reported as 40,395,021 francs, while that for 1921 reached only 13,870,254 francs. Official figures are not available for shipments in 1922 or 1923, but unofficial figures place receipts during 1921 at 11,945 metric tons; 8,606 metric tons in 1922; and during the first 6 months of 1923 5,718 metric tons.

William C. Schwarz, an employee of the Department of Commerce, who has been compiling dye import statistics at the Appraiser's Stores in New York City, has rendered his resignation, effective as of Oct. 31, on account of illness. G. R. Rebel of New York has been appointed to carry on Mr. Schwarz's work.

Henry H. Stiller, formerly connected with the Superfos Co., New York City, has again joined that company in the capacity of sales manager.

The recent conference held in New Orleans to discuss measures for checking boll weevil losses to the cotton crop resulted in the appointment of a committee with the purpose of forming a permanent organization.

During July 400 tons of manganese ore was exported from Colon, Panama. This was the first shipment of this class of material since 1920.

A contract has been signed by the Imperial Oil Co. and the British Empire Steel Corporation of Canada to take the whole benzol output of the byproduct plant at Sydney.

The Canadian Industrial Alcohol Co.'s plant at Corbyville, Ont., which was destroyed by fire last June, is being rebuilt. The total outlay is estimated at $175,000.

As a result of negotiations with the traffic committee of the Rubber Association of America, Eastern railroads have agreed to establish a carload rate on rubber goods to the Pacific coast of $3 per 100 lb., a reduction of about 9.6 per cent from present rates on all-rail shipments.

Main offices of the Palmolive Co. will be moved from Milwaukee to Chicago. The change will involve executive heads of the company and employees in the accounting and auditing departments.

Large Increase Estimated for Chilean Nitrate Exports

Nitrate of soda to the extent of 2,500,000 tons will be exported from Chile during the current fiscal year, the Nitrate Producers' Association estimates. This will be nearly 1,000,000 tons more than the exports during the fiscal year ended June 30, 1923.

Chemical Salesmen Will Hold Dinner Nov. 8

The Salesmen's Association of the American Chemical Industry will hold its first dinner of the season for the fiscal year at the Builders' Club, 34 West 33rd St., on Thursday evening, Nov. 8. Among the speakers will be Elmer H. Bobst, of the Hoffman-La Roche Chemical Co., who will speak on "Conditions of the Chemical Industry on the Continent of Europe." P. S. Tilden, of the du Pont company, and Milton Kutz, of the Roessler & Hasslacher Chemical Co., will talk on the subject of contracts.

At the business session it is expected that the question of limiting memberships in the association will be discussed. A definite program covering the educational course to be held at one of the local universities will be submitted.

Complete list of committee members recently appointed follows:

Membership Committee—F. P. Summers, chairman, Noil Chem. & Color Works; W. H. Chamberlain, Hooker Electrochem. Co.; W. F. Tuttle, *Chemical Color & Oil Record;* R. C. Anthony, H. W. Peabody & Co.; P. M. Dinkins, Kalbfleisch Corp.

General Affairs Committee—John A. Chew, chairman, Warner Chemical Co.; D. C. Blanke, American Cyanimid Co.; John H. Montgomery, Antoine Chiris Co.; Edward L. Shattuck, Abbott Laboratories; H. R. Wemple, Texas Sulphur Co.

Auditing Committee — Adolph C. Schwarz, chairman, Roessler & Hasslacher Chemical Co.; Charles F. McKenna, Chemical Catalog Co., Inc.; A. M. Hopper, Mallinckrodt Chemical Works.

Publicity Committee—E. H. Bedell, chairman, *Chem. & Met.;* W. C. Turrell, Thomas F. Turrell & Co.; W. A. Thompson, Butterworth-Judson Corp.; Forrest B. Kingsley, National Oil & Supply Co.; F. G. Zinsser, Zinsser & Co.

Chemical Foundation Files Final Brief

In its final brief in its defence against the charges brought by the government regarding the disposition of the patents which it now controls, the Chemical Foundation emphasizes emphatically that Wilson was not "seriously ill" when he signed the executive order authorizing the sale in question. The brief, which was filed in the courts at Wilmington, Del., on Oct. 29, charges that the government's suggestion that the order was signed "in the sickroom" was evidently made "in order to induce the court to give this executive order little or no legal force and effect because of the illness of the President." The effort is made further to show that Mr. Wilson was perfectly capable and in fact was transacting a large amount of public business at the time. The final clincher in the argument of the Foundation comes in its question whether a court "can properly substitute its judgment for that of President Wilson in respect of what was or was not in the public interest in war time."

It is expected that the government's final brief will be filed in the near future and that Judge Morris' decision will not be rendered for several weeks at least.

Improvement in British Chemical Industries

Our Correspondent Reviews the Status and Prospects of Leading Chemical Corporations

Conditions in the chemical industries of Great Britain, according to *Chem. & Met.'s* London correspondent, are now taking a much more hopeful turn partly on account of political developments and mainly because of an incipient business revival and the hopes and prospects of the Empire Exhibition to be held next year at Wembley. This is an outstanding event of vital importance to progressive business men entirely apart from the value of its chemical exhibits.

Although the British Dyestuffs Corporation did somewhat better in the last financial year, it is by no means "out of the woods." The next step that is needed—and said to be contemplated—is a drastic reduction in capital, and it seems that this will be accomplished by cutting down the nominal value of the deferred shares, the preferred and preference denominations being left untouched.

The report of the British Cellulose & Chemical Manufacturing Co. disclosed, as was foreshadowed, a bad financial result for the 20 months ended Feb. 28, 1923, but the anodyne of optimistic prediction was duly forthcoming from Sir Harry McGowan at the annual meeting. The company seems to have solved its main technical difficulties, is producing an excellent artificial silk, plain or colored, and commands an enterprising sales organization. The company is said to be making 10,000 lb. of "Celanese" silk a day at a profit of $1 a pound, and at the end of this year the output is expected to attain 20,000 lb.

Another important concern, British Glues & Chemicals, Ltd., also shows signs of improvement, although its profits are very small in relation to its capital, and the dividends on the preference capital are now 2 years in arrears. The company appears, however, to be well and conservatively managed, and should utimately come into its own. Nobel Industries, Ltd., stands out prominently as the most successful of recently formed combines; aided by a good contribution from its large holdings in the General Motors Corporation of the United States, it is paying 7½ per cent on its ordinary capital, as against 5 per cent for the previous year. The success of this undertaking must be ascribed primarily to the excellent nucleus organization, comprising technical as well as commercial ability, bequeathed to it by the original Nobel Explosives Co.

New York Chemists' Club Announces Meetings

The schedule of meetings for the 1923-24 season at the Chemists' Club, New York, to be held at Rumford Hall is as follows:

Nov. 9—American Chemical Society (in charge), Society of Chemical Industry, American Electrochemical Society, Société de Chimie Industrielle, joint meeting.

Nov. 16—American Electrochemical Society, regular meeting.

Dec. 7—Society of Chemical Industry, regular meeting.

Dec. 14—American Chemical Society, regular meeting.

Jan. 4—American Chemical Society, regular meeting.

Jan. 11—Society of Chemical Industry, Perkin Medal.

Feb. 8—American Electrochemical Society (in charge), Society of Chemical Industry, Société de Chimie Industrielle, American Chemical Society, joint meeting.

Mar. 7—American Chemical Society, Nichols Medal.

Mar. 21—Society of Chemical Industry, regular meeting.

April 18—Society of Chemical Industry (in charge), American Electochemical Society, Société de Chimie Industrielle, American Chemical Society, joint meeting.

May 2—American Chemical Society, regular meeting.

May 9—Société de Chimie Industrielle (in charge), American Chemical Society, American Electrochemical Society, Society of Chemical Industry, joint meeting.

May 16 — Society of Chemical Industry, regular meeting.

June 6—American Chemical Society.

Goodyear Purchases Rights to Make Zeppelins

Rights and patents to manufacture Zeppelin dirigibles in this country have recently been purchased by the Goodyear Tire & Rubber Co., Akron, Ohio. An official announcement to this effect which has just been made states that the agreement includes the right to manufacture all engines, machinery and auxiliaries for this type of dirigible. The purchase price, although not announced, is understood to have been one of the highest in the history of aviation.

Akron is to become the center of manufacture of this type of craft if plans now on foot to use the Wingfoot Lake Aviation Field and the plant of the company in Akron for turning out the Zeppelins. It is indicated that fast overland and oversea service is contemplated with the new craft as soon as possible. For the purpose of design and building German engineers are to be brought from the home plant at Friedrichshafen.

The Goodyear Co. has done considerable manufacturing of this kind for the United States Government and has several dirigibles under construction at present.

Market Conditions

Contract Business More Prominent In Chemical Trading

Establishment of Prices for Deliveries Over Distant Periods Results in Numerous Orders—Spot Business Mainly Confined to Small Lots

PRODUCERS who have announced contract prices on forward deliveries, in some cases over all of next year, have found a good response from consumers and are reported to have booked numerous quantity orders in the past few weeks. This has special reference to bichromates, mineral acids, arsenic, bleaching powder, and since last week to caustic soda and soda ash. Present contracts compare very favorably with those of last year and the revised price on bleaching powder as announced on the first of the month would make that material very attractive to buyers were it not for the fact that the trade is confronted with the unusual spectacle of persistent price reductions which have destroyed all confidence in values and which serve to retard rather than to assist buying.

Interest in bleaching powder was sustained by the irregularity of prices. Spot and nearby deliveries are largely a matter of negotiation, with sellers engaged in cutthroat competition. Contract prices for next year also were reported to be shaded and one producer came out with an open quotation of $1.35 per 100 lb. in carload lots at works. Even at this price buyers are reluctant to operate because present merchandising of bleach is destroying all confidence in values and buyers hold that no price is low if their competitors are enabled to place contracts lower than they can. Incidentally stocks of bleach are said to be still large in certain quarters and possibly no stable market may be expected as long as these stocks hang over the market.

The weighted index number moved upwards during the week with advances in crude cottonseed oil as the dominating factor. Price declines, however, seemed to be more numerous than advances in the straight chemical list and many of the downward revisions appear to be safe from reactions in the immediate future, so that price trends are expected to develop according as the buying movement increases or declines.

With the exception of arsenic, chemicals from foreign markets are of easy tendency and exert a bearish influence on values for competing domestic goods. This is illustrated in the case of prussiates, tartaric acid, potash, alum and caustic potash.

Arsenic again was the center of attraction with no let up in the strengthening tendency of the market. The home output undoubtedly has been subjected to curtailment and as offerings from foreign countries are limited with sellers moving the price upward, the prospect is favorable for further advances in price.

Acids

Acetic Acid—Routine deliveries are taking large quantities into consumption with a moderate amount of new business. There is no special feature to the present market and no change in quoted prices has been made in some time. The quotations, however, have been subject to some shading and on some grades this condition still holds good. Quotations are $3.38@$3.63 per 100 lb. for 28 per cent; $6.78@$7.13 per 100 lb. for 56 per cent; $9.58@$9.83 per 100 lb. for 80 per cent; $12@$12.78 per 100 lb. for glacial.

Contract Prices for Bleaching Powder Reduced—Keen Interest in Arsenic with Values Rising—Prussiates Weak — Imported Tartaric Acid Sells at Private Terms — Domestic Tartaric Down 2c. per lb. — Mineral Acids Moving More Freely—Tin Crystals and Bichloride of Tin Marked Up.

Citric Acid—There were offerings of imported acid at 48½c. per lb. but trading was hardly active enough to test the stability of values and it was intimated that 48c. per lb. could be done. The quotation for domestic acid was held at 49@50c. per lb. with demand light.

Oxalic Acid—Importers are keeping their price at a minimum of 12c. per lb. with demand running to small lots. Domestic grades are quoted at 11¾c. per lb. at works, which places freight rates in a prominent position in determining relative values for foreign and domestic at delivered points.

Sulphuric Acid—New business has been heavier and shipping instructions on old orders have been received in a fairly large way and the outward movement from plants has been considerably larger. As surplus stocks are lowered the tenor of prices becomes firmer but competition is still keen enough to hold the market in an easy position. Quotations are $9@$10 per ton in tanks at works, for 60 deg.

Tartaric Acid—Weakness in imported grades has been prominent recently and as demand has continued light it was possible to do 29c. per lb. In the middle of the week domestic producers revised their asking price to 32½c. per lb. in order to bring their offerings closer to the value of imported. This represented a decline of 2c. per lb. in the domestic product.

Sodas

Soda Ash—The lower schedule of prices as recently announced has stimulated interest in forward positions and a very satisfactory business is reported. Domestic consumers while not so active as earlier in the year have been consistent receivers of ash and the total movement from works is reported to be materially ahead of that for the corresponding period of 1922. Contract prices are $1.25 per 100 lb., in bulk, for light ash 58 per cent, at works; $1.38 per 100 lb., in bags; and $1.63 per 100 lb., in bbl. Dense ash is offered at $1.35 per 100 lb., in bulk, $1.45 per 100 lb., in bags, and $1.69 per 100 lb., in bbl. These prices are for carlots with the usual premiums for less carlots.

Acetate of Soda—Spot material is offered at 5c. per lb. without bringing out much volume. Little demand is reported for shipment from works and asking prices are given at 5½c. per lb. and upward but the tone is easy and buyers are at an advantage.

Bichromate of Soda—Producers are reported to be carrying orders for deliveries over the next few months with this business placed at different price levels. The current quotation for prompt and nearby from works is 7½c. per lb. and upward according to quantity and seller. The market appears firmer on jobbing lots than on carlots as prices for the former have been less frequently shaded. For later deliveries, that is, over the greater part of next year, asking prices are 7⅞@7¾c. per lb. Production of new Caledonian chrome ore is still restricted and the price holds at $24 per ton, c.i.f. Atlantic ports. Indian ore is offered at $19.50 per ton, and Rhodesian $21.50 per ton.

Caustic Soda—A better call for export was reported and this included several small lots, although quantity lots also were in demand. For standard brands 3.10c. per lb. is asked but outside makes were to be had at 3c. per lb.

Good demand was also reported for home uses and the new contract prices meet with approval of buyers. Contract prices are: Solid caustic soda 76 per cent in standard drums $3.10 per 100 lb.; ground, flake and powdered 76 per cent, in standard drums $3.50 per 100 lb.; solid 74 per cent in standard drums $3.02 per 100 lb. These prices are f.o.b. works.

Prussiate of Soda — Domestic producers continue to offer November shipments at 13½c. per lb. but there is not much call for prussiates and the lower price levels which have been reached have failed to stimulate consumption. Imported prussiate ranges from 13½c. to 13¾c. per lb. with 13½c. per lb. generally quoted.

Potashes

Bichromate of Potash—A better call for supplies was reported by some sellers but in general trading was not heavy. Prices show variations according to seller and quantity with prompt and nearby deliveries at 9½@10c. per lb. Contract prices hold at 9⅝@9¾c. per lb. but chief interest is in nearby goods.

Caustic Potash—The position of foreign caustic has not improved in the interval. Spot holdings are meeting with a very moderate call and were offered at 7c. per lb. Shipments were available at 6¾c. per lb. and the probability of low priced goods for future delivery has taken the edge off the spot market.

Carbonate of Potash—Offerings are fairly large and the market has been under some pressure. Buyers are slow to take hold and lack of interest places some grades in a more or less nominal position. Shipments generally are under the spot levels and this encourages hand to mouth buying. Asking prices for 96-98 per cent are 6½c. per lb., with shipments workable at 6c. per lb. Hydrated is held at 6¾@7c. per lb. with shipments fractionally lower.

Prussiate of Potash—There is very little call for this material and the wide differential between the soda and the potash products has worked in favor of the former, although consumption of prussiate in general has been relatively light. Prices for red prussiate are largely nominal. Spot holdings are not large but there is no buying interest and quoted prices of 60c. per lb. no doubt could be shaded on firm business. Yellow prussiate is slow and price reductions have failed to stimulate buying. Present quotations are 26@27c. per lb. with the market none to firm at the inside figure especially in view of the fact that shipments have been offered a little under the spot price.

Miscellaneous Chemicals

Alum—Some of the large consuming trades are not buying as freely as usual at this time of year but the market has shown an improvement in the past month and a gain is reported in the movement from producing centers. Ammonia lump alum is quoted at 3½@4c. per lb. This quotation also applies to deliveries in distant positions. Imported potash alum has been pressed for sale and with demand slow the market has been in buyers' favor. Quotations are 3@3¼c. per lb.

"Chem. & Met." Weighted Index of Chemical Prices

Base = 100 for 1913-14

This week	166.93
Last week	165.09
Nov., 1922	158.00
Nov., 1921	147.00
Nov., 1920	240.00
Nov., 1919	239.00
Nov., 1918	279.00

Crude cottonseed oil sold at 10c, f.o.b. mills, and this advance in price raised the index number 184 points.

Arsenic—In the open market this material was reported to have overshadowed other selections in interest. Most of the buying came from consumers who wanted small lots but the course of the market is followed closely by the trade as a whole. Spot material is a little easier than shipments as far as imported material is concerned. Domestic arsenic was offered at 13c. per lb. for delivery over the next 2 months. Offerings of domestic, however, are restricted to large consumers and have little effect in the trading market. Sales of Japanese for Nov.-Dec.-Jan. shipment were made at 14¼c. and at 14¼c. A few odd lots on spot were offered at 14c. per lb. Some shipment prices above 15c. per lb. were heard for arsenic from other countries but the trade is not yet prepared to pay such prices although there is very little bearish sentiment in the market.

Barytes—Demand has been more active. Lithopone manufacturing estimated at 90 per cent of normal. Crude $8@$10 per ton, f.o.b. point of production. Unbleached and bleached, ground, $28@$30 per ton, f.o.b. St. Louis. Off color, $12@$14 per ton, f.o.b. Baltimore. White floated, in bbl., $26 per ton, f.o.b. St. Louis.

Bauxite — American, crushed and dried, $5.50@$8.75 per gross ton; pulverized and dried, $12@$14 per gross ton; calcined, crushed, $20@$24 per gross ton, all f.o.b. shipping points. Foreign red bauxite, French, 5 per cent SiO_2, $5@$6; Dalmatian, 2 per cent SiO_2, $6@$6.50 per metric ton, according to grade; foreign white grades, low iron content, $7.50@$8.50, c.i.f.

Bleaching Powder—With the turn of the month the open quotation of some producers was placed at $1.50 per 100 lb. but there is no stability to prices and the market has resolved itself into a matter of private terms with sellers willing to grant concessions in order to hold desirable business. The week was featured by a further cut in the contract price for bleach, as one factor announced that business would be taken at $1.35 per 100 lb., f.o.b. works. Although this figure is too low to admit of bleach manufacture at a profit it would appear that the different producers are not frightened at the low levels reached and competition is apparently as keen as when prices were higher. Liquid chlorine also was offered at lower prices on contract. The revised quotation is on a basis of 3¾c. per lb., in tank cars, at works, for contracts involving more than 50 tons per month. The quotation for liquid chlorine in cylinders was not changed.

Magnesite—There is a good movement of California grades and crude is offered at $14 per ton, calcined at $35@$37 per ton, f.o.b. shipping point. Dead-burned magnesite in sacks is offered at $40@$42 per ton, f.o.b. Pennsylvania shipping point. Bulk shipments are offered at $32@$34 per ton, f.o.b. producing point in Washington. Caustic calcined Grecian is quoted at $50@$51 per ton, c.i.f. New York.

Pyrites—Outside of the acid plants located along the coast, demand for pyrites is slow. The quiet call for stocks and the completion from brimstone create a weak tone to prices. Sellers quote imported lump, 1 in. diameter and up, 11½c. per long ton unit; furnace size, 2½ in. diameter, 12c. per long ton unit; fines, through ½-in. mesh, 11½c. per long ton unit; cinder property of buyer, ex ship, Atlantic ports. Ore contains 50@51 per cent sulphur; cinder about 63 per cent iron.

Tin Crystals—Producers marked up the price at the beginning of the month and established quotations at 32c. per lb., which is an advance of ½c. per lb. Bichloride of tin also was marked up ½c. per lb., making the new price 12½c. per lb. Tin oxide was unchanged at 47c. per lb. Strength in the metal was responsible for the rise in values for the products.

Alcohol

Steady prices prevailed in the market for denatured alcohol. Demand showed further improvement. First hands quote No. 1 special at 41½c. per gal., in drums, carload basis. Completely denatured, 188 proof, No. 1 formula, held at 42½c. per gal., in drums, carload basis. Ethyl spirits, U.S.P., 190 proof, closed unchanged at $4.74@$4.79 per gal., in cooperage. There was no change in the position of methanol. On the 95 per cent 88c. per gal. was asked, in drums, and 93c. per gal., in bbl., carload lots.

Reorganization Plans for Seydel Chemical Co.

Plans for reorganizing the Seydel Chemical Co., which went into bankruptcy in July, will be discussed at a meeting of stockholders to be held in Jersey City on Nov. 16. Herman Seydel, president of the company, attributed the troubles of the company to failure on the part of an investment house to finance the purchase of a plant at Nitro, W. Va. As the latter plant already had been bought, it proved a heavy drain on the original capital of the company until the directors decided to go into voluntary bankruptcy.

Coal-Tar Products

Domestic Trade in Crudes Fair; Export Demand Dull—U.S.P. Phenol Irregular—Pyridine Nominal

PRODUCERS reported a fair volume of business in crudes for domestic consumption, but stated that export demand was comparatively slow. Prices underwent no important change, although the undertone, in numerous instances, was barely steady. Phenol for immediate delivery was offered freely and on round lots it was possible to shade the market. A feature in the week's developments was the announcement from Washington to the effect that a mixture of cresylic acid and coal-tar pitch, which, upon distillation below 215 degrees, yields less than 5 per cent of tar acids, is entitled to free entry under the tariff law of 1922. Believing that the material would be returned under the free list, importers have been bringing in shipments for some time past and the recent weakness in cresylic acid has largely discounted this decision.

Import statistics for September revealed that 5,890,598 gal. of creosote oil arrived here, comparing with a meager 4,127 gal. for the corresponding month a year ago. The movement of crude naphthalene from foreign ports continues on a liberal scale, the September importations amounting to 1,545,952 lb., bringing the total for the 9 months ended Sept. 30 to upward of 17,000,000 lb.

Export demand for crudes has been inactive, English producers, in most instances, being in a position to name lower prices.

Benzene, 90 per cent, was offered in most quarters at 21c. per gal., tanks, works, but scattered lots were traded in at slight concessions. Solvent naphtha, water white, closed at 23c. asked, tank car basis. Napthalene flake was available on contract at 6c. per lb. Pyridine on spot was almost unobtainable and prices were wholly nominal. A little more buying interest was reported in salicylates.

Aniline Oil and Salt—The market was quiet, but first hands continued to quote the oil at 16c. per lb., in drums, prompt shipment from works. On the salt nominal quotations ranged from 23@24c. per lb., depending upon the quantity and seller.

Benzene—The situation underwent scarcely any change. Domestic demand was described as fair, but with sufficient material on hand prices presented a rather unsettled appearance, especially in so-called "outside" quarters. Leading producers maintained prices on the basis of 21c. per gal. for the 90 per cent material, tank cars, f.o.b. works. One factor said that in his opinion the market would hold at the prevailing level over the winter period. By next spring the motor fuel market should improve and it is probable that prices for benzene, in time, will benefit by such developments.

Beta Naphthol—Supplies were considered ample and the market was barely steady at 21@22c. per lb., immediate shipment.

Cresylic Acid—The official announcement regarding the status of a mixture of cresylic acid and coal-tar pitch was welcomed by traders, but it had little or no influence upon prices. Demand for cresylic was described as moderate, and with producers reporting keen competition for business, prices were irregular, ranging from 70@80c. per gal., as to quality and delivery. On spot some holders were asking 85c. on pale 97 per cent material.

Naphthalene—Foreign markets for crude were barely steady, but prices named on c.i.f. offers revealed no changes of consequence. There was some interest locally in flakes for shipment over next year, and first hands named prices ranging from 6@6¼c. per lb., as to quantity. On ball the contract market held around 7c. per lb.

Phenol—U.S.P. phenol for immediate shipment, in drums, was offered at 25c. per lb. The market was irregular and on round lots it was possible to do slightly lower, especially on deferred shipments. One factor reported an accumulation in supplies.

Pyridine—On futures importers were asking $5 per gal. Spot supplies were limited to a few scattered parcels and prices heard ranged from $5.75@$6 per gal.

Salicylates—Producers say that present selling prices are based on rather low prices for phenol and a decline in the market hardly seems probable. In fact the undertone appears to favor sellers. Inquiry showed moderate improvement.

Solvent Naphtha—The market closed unchanged. Water white was offered by producers for prompt shipment from works at 23c. per gal., tank car basis.

Xylene—Pure was offered to the trade at 50@55c. per gal., in drums, with the commercial grade at 34c. per gal. Offerings have increased.

Sweden Develops New Sulphite Distillate

Recent experiments carried out in Sweden are said to have demonstrated the commercial value of a motor spirit called "bentyl," which is composed of sulphite spirit distilled from the sulphite lye of the wood-pulp mills mixed with 20 to 25 per cent of benzol. As there are now twenty-two sulphite distilleries in Sweden with an annual output of about 20,000,000 liters of 100 per cent alcohol from lye, the new motor fuel may prove to be a serious competitor of imported gasoline.

Financial

For the 3 months ended Sept. 30, the Texas Gulf Sulphur Co. reports net earnings of $1,186,515 equivalent to $1.87 a share.

The Palmolive Co. of Delaware will take over and operate all plants of the Palmolive Co. with the exception of the Milwaukee plant and sales offices in Wisconsin. The new corporation will have an authorized capital of $12,000,000. Holders of the present preferred stock will be asked to exchange for Palmolive Co. of Delaware stock. The old stock will be redeemed at 105, the legal rate, and the new will be issued on the basis of 101, giving a 4 point profit. The part of the $4,000,000 new stock not needed for the exchange is expected to be offered to the public.

A deficit of $3,826,034 is reported as a result of operations of the Central Leather Co. for the quarter ended Sept. 30.

The directors of the Goodyear Tire & Rubber Co. have voted to retire $5,000,000 prior preference stock on or before Feb. 1, 1924. This will reduce the outstanding amount of prior preference stock to $15,000,000.

Net profits of the Air Reduction Co. for the third quarter of the year were $655,703 before payment of taxes. This compares with $728,458 for the second quarter and $181,311 for the first quarter of the year.

The Will & Baumer Candle Co. of Syracuse, N. Y., has declared the regular quarterly dividend of 25c. per share, payable Nov. 15.

The General Asphalt Co. has declared a regular quarterly dividend of 1¼ per cent on preferred stock.

The Ohio Leather Co. reports net earnings for 9 months ended Sept. 30 of $48,151 after dividends on first preferred. In September the company lost $11,000. Current assets are given as $3,213,186, against current liabilities of $170,760.

During its fiscal year ended Sept. 30, the Goodyear Tire & Rubber Co., Ltd., of Canada, paid off the balance of its 3-year 8 per cent notes, amounting to $494,565. The company also paid back dividends on prior preferred and resumed dividends on preferred stock.

Annual report of American Cotton Oil Co. for year ended Aug. 31 showed a deficit after charges and inventory adjustment of $4,019,892. In the last 4 years the company has shown aggregate losses of $13,455,651.

Indigo Prices for 1924

E. I. du Pont de Nemours & Co. have announced contract prices on indigo 20 per cent paste for 1924 delivery on the basis of 25c. per lb., carload lots, f.o.b. shipping point, freight allowed. The new price is 1c. below the prevailing spot quotation.

Vegetable Oils and Fats

Crude Cottonseed Advances—Linseed Futures Unsettled—Good Call for Olive Foots—Tallow and Greases Up

Spot holdings of vegetable oils and fats are light, which tends to support prices in the face of more favorable prospects in regard to supplies for delivery over the first quarter of 1924. Demand for finished products has improved and this was reflected in the week's trading in the market for raw materials. Higher prices obtained for crude cottonseed oil, corn oil, tallow and greases. Palm oils for shipment were easier. Italian green olive oil foots sold at 8¼c. Ceylon type coconut oil sold at 8¼c., loose, New York. Linseed on spot was steady, but futures were unsettled. China wood was irregular.

FAIR buying for nearby requirements was reported in the market for vegetable oils and fats. Soap making materials came in for most of the attention. The drying oils were not so active because of the prospects for a bumper flaxseed yield in the Argentine.

Cottonseed Oil—Reduced estimates on the cotton crop made bears a little cautious and no real pressure was apparent, although most operators regarded prices as too high. The strength in lard also has a bullish factor. At times refiners indulged in a little selling of refined oil in the option market in an effort to stem the advance, but at all times it was evident that the market for crude could not be manipulated. In fact crude sold at 10c. per lb., tanks, f.o.b. mills, an advance of ¼c. for the week. Operators who stopped most of the tenders for October refined oil were confident that the next Census Bureau report would be bullish and they were disposed to hold on to their supplies for better prices. Spot prime summer yellow sold around 12½c. per lb., in cooperage, while the November option sold for less than 12c. throughout the week. Private estimates on the October disappearance of refined oil ranged from 190,000@200,000 bbl. Bleachable oil settled at 10½@10¾c. per lb., tanks, f.o.b. Texas common points. Cottonseed fatty acids closed nominally at 4¾@5c. per lb., f.o.b. mills. Lard compound was steady at 13½@13¾c. per lb., in bbl., carload lots, f.o.b. New York.

Linseed Oil—Demand was moderate and confined almost entirely to nearby deliveries. Prices underwent scarcely any change. Spot oil was regarded as steady at 92c. per gal., in bbl., carload lots, with November at 90c., December at 88c. and January forward at 86c. On the distant deliveries prices were unsettled at all times as no business of consequence went through. The news from the Argentine was a little mixed, the weather in some sections being less favorable. But traders still regard the prospects for a huge crop as bright and sentiment in nearly all quarters, on futures, was bearish. Several crushers look for nearby prices to hold as Argentine shipments of seed in the past month have been light, while holdings of new crop seed in the Northwest appear to be in firm hands. Crushers have been active buyers of domestic seed and larger receipts had little influence upon the market. Stocks of seed at Minneapolis were estimated at 428,335 bu., comparing with 443,839 bu. a week ago, and 79,980 bu. a year ago. Cake held at $40 per ton, f.a.s. New York.

China Wood Oil—A large operator in wood oil has been buying up supplies at Hankow and this has steadied the market in the Far East. Locally spot prices covered a wide range as receipts increased and resale offerings were in evidence. Closing prices were nominal at 20½@21½c. per lb. On the coast futures settled at 19½c., tank cars.

Coconut Oil—Bulk offerings were more numerous and this unsettled prices. On the Pacific coast Manila oil for shipment was available at 7¼c. per lb., bulk basis, equal to 8c. sellers' tanks. There were rumors of bulk business here at 8¼c. per lb., c.i.f. New York, although the tank car quotation named by domestic producers held at 8½c. per lb. The copra market was steady at 4¾@5c. per lb., c.i.f. coast, as to brand.

Corn Oil—Last sales went through at 10c. per lb., November shipment, tank cars, f.o.b. point of production.

Olive Oil Foots—Prime green Italian foots sold at 8¾c. Spanish foots sold at 8½c. Market more active and firm.

Palm Oils—Sales of Lagos on spot at 7.65c. per lb. Lagos for shipment offered at 7.60c. Niger for shipment offered at 7.06c. per lb., c.i.f. New York.

Rapeseed Oil—Refined oil on spot sold at 72½c. per gal. On futures 75c. asked.

Soya Bean Oil — Market higher on scanty offerings for nearby delivery. Crude in sellers' tanks, immediate shipment, held at 10.10c. per lb., f.o.b. Atlantic port. On futures 7¼c. asked, bulk basis, c.i.f. New York.

Menhaden Oil—Stocks on coast estimated at 5,000 bbl. Fishing was poor all week and prices closed firm at 47½@50c. per gal., tanks f.o.b. factory.

Tallow and Greases—Extra special tallow sold at 8c. per lb., loose, an advance of ¼c. Choice yellow grease higher at 6¾@7c. per lb. High acid yellow 6¼@6½c. per lb. Oleo stearine sales at 11¼c. No. 1 oleo oil 14¾@15c. per lb.

Miscellaneous Materials

Antimony—Market strong on reports of political disturbances in China. Late in week spot goods held at 9@9½c. per lb. Chinese needle antimony, lump, nominal, 5.50c. per lb. Standard powdered needle antimony (200 mesh), 6@6.50c. per lb. White antimony oxide, Chinese, guaranteed 99 per cent Sb_2O_3, 7.50c.

Glycerine—Chemically pure in better demand, but prices unchanged at 16½@17c. per lb., in drums, carload lots, according to seller. Last sales dynamite 16¼c. per lb., carload lots, f.o.b. point of shipment in the West. Soap lye crude, basis 80 per cent, loose, sold at 10¾c. per lb.

Dry Colors—Chrome green reduced to 28c. per lb. Chrome yellow lowered to 17c. per lb. Prices on iron blues unsettled at 45@50c. per lb. Easier market for raw materials.

Shellac—Demand fair and prices firmer, T.N. closing at 61c. per lb., against recent business at 60c. Bleached, bonedry, 73@74c. per lb.

Turpentine—Export demand slow and with no improvement in the domestic call prices were unsettled. Spirits of turpentine closed at 98c. per gal., in bbl., a reduction of 1c. for the week.

White Lead—There was a decline of 10 points in the price of pig lead, but this resulted in no change in prices for the pigments. Holdings of white lead are not burdensome and leading interests continued to quote on the basis of 9¾c. per lb., on standard dry (basic carbonate), in casks, carload lots.

Zinc Oxide—Trading was inactive, but first hands maintained prices on the basis of 8c. per lb., for the American process, lead free, carload lots. French process, red seal, held at 9¾c. per lb., carload lots.

Artificial Silk Plant Expanding Activity

The plant of the American Cellulose & Chemical Manufacturing Co., at Amcelle, Md., is about to be expanded, according to a recent statement of the president, Dr. Camille Dreyfus, who has just returned from England.

Plant and new cash capital now represent an investment of about $10,000,000. Present equipment provides for the manufacture of the cellulose acetate, from which the fiber is made, and when additions to the plant are completed, equipment will be installed for manufacturing the silk fiber, dyeing it, and finishing and weaving it into cloth. An output of a ton per day is expected within 6 months.

In discussing the fiber now being turned out in England on a successful commercial scale, Dr. Dreyfus said that it has been found possible to spin a filament as fine as two or two and one-half denier, which has the elasticity and water-resisting properties of the heavier deniers of the same product. He has brought with him samples of a number of interesting fabrics being made entirely from this fiber in England or on the Continent.

Imports at the Port of New York

October 26 to November 1

ACIDS—Citric—50 csk., Palermo, Order; 112 cs., Palermo, W. Newburg. **Formic**—74 demijohns, Hamburg, Innis, Speiden & Co.; 147 carboys, Hamburg, Order. **Oxalic**—48 csk., Christiania, Roessler & Hasslacher Chemical Co. **Tartaric**—500 csk., Palermo, Order; 500 csk., Palermo, W. Newburg; 100 csk., Rotterdam, W. Benkert & Co.; 483 csk., Rotterdam, Order; 50 csk., Marseilles, French American Banking Corp.

ALBUMEN — 73 cs., Shanghai, T. M. Duche & Sons; 21 cs., Shanghai, Gasco Spec. Co.; 35 cs., Tientsin, Order; 21 cs., Shanghai, Order; 60 cs., Shanghai, Wah-Chang Trading Co.; 162 cs., Shanghai, Equitable Trust Co.

ALCOHOL — 110 bbl., Arecibo, Order; 225 dr., Arecibo, C. Esteva.

ANTIMONY REGULUS—500 cs., Shanghai, Standard Bank of South Africa; 500 cs., Shanghai, Order; 1,600 cs., Shanghai, Wah-Chang Trading Co.; 750 cs., Shanghai, International Banking Corp.

ANTIMONY—250 bg. white, Shanghai, International Banking Corp.

ARSENIC—220 cs., Kobe, H. Sundheimer; 121 bbl., Tampico, American Smelting & Refining Co.; 90 bbl., Tampico, American Metal Co.

CALCIUM CHLORIDE—1,000 csk., Hamburg, Mechanics & Metals National Bank.

CALCIUM NITRATE—868 csk., Brevik, Order.

CAMPHOR—200 bbl., Hamburg, A. Ochse & Co.; 45 bbl., Hamburg, Order; 200 cs., Shanghai, Hetherman & Co.

CASEIN—91 bg., Hamburg, Bank of the Manhattan Co.; 230 bg., Hamburg, Order; 984 bg., Buenos Aires, Kalbfleisch Corp.

CHALK—300 bbl. and 2,024 bg., Antwerp, Bankers Trust Co.

CHEMICALS—12 bbl., Hamburg, Hummel & Robinson; 20 keg, Hamburg, Chaplain & Bibbo; 9 csk., Hamburg, Order; 17 pkg., Hamburg, Eimer & Amend; 54 cs., Hamburg, Agfa Products, Inc.; 362 csk., Rotterdam, Stanley, Daggett, Inc.; 225 cs., Rotterdam, Order; 67 dr., London, Order; 8 cs., Antwerp, Guaranty Trust Co.

CHROME ORE—1,000 tons, Beira, E. J. Lavino & Co.

COLORS—20 cs. dry, Hamburg, Kuttroff, Pickhardt & Co.; 2 csk. dry, Hamburg, Carbic Color & Chemical Co.; 81 csk. coal-tar, Rotterdam, Kuttroff, Pickhardt & Co.; 33 csk. aniline, Rotterdam, H. A. Metz & Co.

CORUNDUM ORE — 367 bg., Delagoa Bay, E. R. Legg & Co.

COPRA—500 bg., Belize, Franklin Baker Co.; 1,292 tons (bulk), Cebu, Order; 172 bg., Panama, I. Brandon & Bros.; 2,500 tons, Cebu, Proctor & Gamble Co.; 418 bg., Ruatan, J. A. Elliot & Co.

CREAM TARTAR—160 csk., Marseilles, French-American Banking Corp.

CREOSOTE OIL — 4,984 tons, Cardix, Order.

CUTCH—500 bg., Singapore, Order.

DIVI-DIVI—505 bg., Pampatar, Eggers & Heinlein; 290 bg., Pampatar, Standard Commodities Co.

DYESTUFFS—8 pkg., Genoa, American Exchange Natl. Bank.

FERROSILICON — 269 keg, Stavanger, Electro Metallurgical Co.

FLUORSPAR—208 tons, Capetown, Order.

GALLNUTS — 500 cs., Hankow, Mallinckrodt Chemical Works.

GAMBIER—3,400 cs., Singapore, Order.

GUANO—Cargo in bulk, Callao, Order.

GUMS—200 cs. damar, Singapore, L. C. Gillespie & Sons; 820 bg. copal, Antwerp, Central Union Trust Co.; 488 bg. copal, Antwerp, Chemical National Bank; 15 bg. copal, Antwerp, Order; 205 bg. copal, Antwerp, W. Schall & Co.; 205 bg. do., Antwerp, Central Union Trust Co.; 100 cs. and 70 bg. copal, Hong Kong, Guaranty Trust Co.; 360 cs. do., Hong Kong, L. C. Gillespie & Sons; 210 bg. copal, Hong Kong, Order; 50 cs. and 140 bg. copal, Singapore, Guaranty Trust Co.; 256 cs. damar, Singapore, Chemical National Bank; 187 cs. damar, Singapore, Order; 512 bg. arabic, Port Sudan, Brown Bros. & Co.; 35 cs. and 69 bg. copal, Manila, Central Union Trust Co.; 61 cs. kauri, Auckland, Guaranty Trust Co.; 409 sk. do., Auckland, Brown Bros. & Co.; 245 cs. do., Auckland, Baring Bros. & Co.; 1,220 pkg. do., Auckland, Order; 50 sk. arabic, Marseilles, Thurston & Braidich; 21 bg. damar and 15 pkg. copal, Singapore, Kidder, Peabody & Co.; 100 bg. damar, Singapore, Baring Bros. & Co.; 280 bg. copal, Singapore, L. C. Gillespie & Sons; 298 bg. copal, Singapore, Order; 67 bbl. damar, London, Order; 127 bg. copal and 10 cs. damar, London, Toch Bros.

IRON OXIDE — 76 bbl., Malaga, J. L. Smith & Co.; 59 bbl., Malaga, E. M. & F. Waldo; 572 bbl., Malaga, C. K. Williams & Co.; 228 bbl., Malaga, Am. Ex. Natl. Bank; 84 bbl., Malaga, S. L. Libby Corp.; 107 bbl., Malaga, National City Bank; 300 bg., Malaga, Irving Bank-Col. Trust Co.; 20 bbl., Malaga, C. F. Osborne & Co.; 91 bbl., Malaga, National Bank of Commerce; 30 csk., Liverpool, J. A. McNulty.

IRON SULPHATE — 47 cs., Hamburg, Order; 82 bbl., Liverpool, Order.

LOGWOOD EXTRACT—169 bbl., Cape Haiti, Logwood Extract Co.

MANGANESE—3 bbl., Hamburg, Cooper & Cooper, Inc.

MANGROVE BARK—3,395 bg., Beira, Bingham & Co.; 1,000 bg., Singapore, Order.

MAGNESIULM CITRATE — 168 cs., Genoa, Order.

MAGNESITE — 102 bbl., Rotterdam, Speiden, Whitfield Co.

MYROBALANS — 6,400 pkt., Calcutta, Order.

OCHER—657 csk., Marseilles, Reichard-Coulston, Inc.; 120 csk., Marseilles, J. L. Smith & Co.; 75 bbl., Malaga, Hummel & Robinson.

OILS—China Wood—464 bbl., Hamburg, Oelrichs & Co.; 70 bbl., Hong Kong, Tappenbeck Co.; 100 bbl., Shanghai, Mitsui & Co.; 300 csk., Shanghai, Balfour, Williamson & Co.; 242 csk., Hong Kong, Bank of the Manhattan Co.; 100 dr., Hong Kong, Order; 178 bbl., Hankow, Anderson, Meyer & Co.; 45 bbl., Hong Kong, Order; 144 bbl., Hankow, National City Bank; 287 bbl., Hankow, Asia Banking Corp.; 610 bbl., Hankow, Schulz & Ruckgaber; 305 bbl., Hankow, Order. **Cod**—116 csk., Halifax, Cook & Swan Co.; 200 csk., St. Johns, R. Badcock & Co.; 150 csk., St. Johns, Swan & Finch; 10 bbl., Bergen, Order. **Coconut**—770 tons (bulk), Manila, Spencer, Kellogg & Sons; 1,910,720 lb. (bulk), Manila, Philippine Refining Co.; 816 tons (bulk), Manila, Order. **Olive foots** (sulphur oil)—250 bbl., Naples, Banca Commercial Italiano; 602 bbl., Malaga, Order; 598 bbl., Malaga, Order. **Palm**—39 csk., Lagos, Order.

OIL SEEDS—Linseed—500 tons (bulk), Buenos Aires, Bunge North American Grain Corp.; 68,628 bg., Buenos Aires, Spencer Kellogg & Sons; 8,721 bg., Buenos Aires, Order. **Castor**—1,366 bg., Cocanada, Volkart Bros.; 7,469 bg., Cocanada, Order.

POTASSIUM SALTS — 9 cs. perborate, Copenhagen, Meadows, Wye & Co.; 400 bbl. permanganate, Hamburg, Roessler & Hasslacher Chemical Co.; 17 csk., Hamburg, Innis, Speiden & Co.; 1,000 bg. muriate, Hamburg, Potash Importing Corp. of America; 15 csk. metabisulphite, Hamburg, R. W. Greeff & Co.

PLUMBAGO—500 bbl., Colombo, Order; 300 bbl., Colombo, N. Y. Trust Co.; 156 bbl., Colombo, Brown Bros. & Co.

PYRIDINE—7 dr., Antwerp, H. W. Peabody & Co.

QUICKSILVER—600 flasks, Alicante, Order; 100 flasks, Alicante, Order.

QUEBRACHO—11,100 bg., Buenos Aires, Fourth Atlantic National Bank of Boston; 443 bg., Buenos Aires, International Products Co.; 2,015 bg., Buenos Aires, Order.

SAL AMMONIAC — 19 bbl., Hamburg, Hans Hinrichs Chemical Corp.

SHELLAC—50 bg., Hamburg, A. Helmrath, Inc.; 400 bg., Calcutta, Standard Bank of South Africa; 200 bg., Calcutta, Maclac Co.; 100 bg., Calcutta, Arbuthnot, Latham & Co.; 700 bg., Calcutta, British Bank of South America; 450 bg., Calcutta, New York Trust Co.; 1,805 bg., Calcutta, Order; 152 cs., Calcutta, Order; 44 sk., Marseilles, Order.

SILVER SULPHIDE—7 cs., South Pacific ports, Bank of Central & South Am.

SODIUM SALTS — 67 csk., phosphate, Antwerp, Roessler & Hasslacher Chemical Co.; 140 dr., sulphite, Hamburg, C. S. Grant & Co.; 100 csk. hyposulphite, Hamburg, Order; 24,369 bg. nitrate, Antofagasta, Wessel, Duval & Co.; 331 cs. hyposulphite, Marseilles, E. M. Sergeant & Co.; 10 cs. perchlorate, Marseilles, Meadows, Wye & Co.; 304 bbl. chlorate, Barcelona, E. Suter & Co.; 130 dr. sulphide, Antwerp, E. M. Sergeant & Co.; 4,259 bg. nitrate, Brevik, Order.

SUMAC—350 bg., Palermo, A. Klipstein & Co.; 200 bales and 3,150 bg., Palermo, Order.

TALC—800 bg., Genoa, L. A. Salomon & Bros.

TALLOW — 709 csk. inedible, Buenos Aires, National City Bank; 250 bbl., Vancouver, Terminal Provision Co.

TARTAR—210 sk., Valencia, C. Pfizer & Co.; 35 csk., Naples, Tartar Chemical Works; 458 sk., Marseilles, C. Pfizer & Co.; 1,151 sk., Marseilles, Tartar Chemical Works; 286 csk., Marseilles, C. Pfizer & Co.; 4,918 bg. crude, Buenos Aires, Tartar Chemical Works.

WATTLE BARK — 626 bg., Durban, Bingham & Co.

WAXES — 128 cs. paraffine, Puerto Mexico, Asiatic Petroleum Co.; 50 cs. bees, Hamburg, Innis, Speiden & Co.; 3 bg. bees, Mayaquez, D. Steengrafe; 50 bg. mineral, Hamburg, L. S. Tainter; 30 bg. bees, Rotterdam, Ponds Extract Co.; 44 bg. bees, Rio de Janeiro, Sullivan, Kyle & Co.; 8 bbl. bees, Rio de Janeiro, D. Steengrafe.

ZINC OXIDE — 50 bbl., Marseilles, Reichard-Coulston, Inc.

ZINC WHITE — 10 bbl., Marseilles, A. Kramer & Co.

Latest Quotations on Industrial Stocks

	Last Week	This Week
Air Reduction	64¼	63¼
Allied Chem. & Dye	62⅝	64
Allied Chem. & Dye pfd.	106⅝	106⅝
Am. Ag. Chem.	11¼	10½
Am. Ag. Chem. pfd.	30½	31¼
American Cotton Oil	6¼	5⅝
American Cotton Oil pfd.	19¼	18¼
American Cyanamid	*73	74
Am. Drug Synd.	6⅛	6
Am. Linseed Co.	14¼	15½
Am. Linseed pfd.	30	29½
Am. Smelting & Refining Co.	52⅞	54½
Am. Smelting & Refining pfd.	97	96
Archer-Daniels Mid. Co., w.i.	26	25
Archer-Daniels Mid. Co. pfd.	90¼	90½
Atlas Powder	*53	54
Casein Co. of Am.	*63	*64
Certain-Teed Products	30	30
Commercial Solvents "A"	*33	*33
Corn Products	124⅜	127
Corn Products pfd.	116	116½
Davison Chem.	*47	*47
Dow Chem. Co.	49⅜	48⅜
Du Pont de Nemours	126¼	129⅜
Du Pon de Nemours db.	84½	84¾
Freeport-Texas Sulphur	11¼	11¼
Glidden Co.	7	7
Grasselli Chem.	*132	*132
Grasselli Chem. pfd.	*145	*145
Hercules Powder	108	108
Hercules Powder pfd.	104	104
Heyden Chem.	*1⅛	1
Int'l Ag. Chem. Co.	*1⅛	*1⅛
Int'l Ag. Chem. pfd.	5¼	4⅜
Int'l Nickel	11	10⅜
Int'l Nickel pfd.	76	76
Int'l Salt	80	83½
Mathieson Alkali	31½	35
Merck & Co.	*68	*70
National Lead	117⅜	120½
National Lead pfd.	112½	112½
New Jersey Zinc	143	140
Parke, Davis & Co.	77⅜	78
Pennsylvania Salt	88⅜	88½
Procter & Gamble	*132	*134
Sherwin-Williams	31½	*32
Sherwin-Williams pfd.	*100	*100
Tenn. Copper & Chem.	*8⅜	8⅜
Texas Gulf Sulphur	58	58¼
Union Carbide	52	53¼
United Drug	75½	74¾
United Dyewood	*42½	*42½
U. S. Industrial Alcohol	52¾	53
U. S. Industrial Alcohol pfd.	97	98
Va.-Car. Chem. Co.	7⅛	7⅛
Va.-Car. Chem. pfd.	*24	22

*Nominal. Other quotations based on last sale.

Current Prices in the New York Market

For Chemicals, Oils and Allied Products

THESE prices are for the spot market in New York City, but a special effort has been made to report American manufacturers' quotations whenever available. In many cases these are for material f.o.b. works or on a contract basis and these prices are so designated. Quotations on imported stocks are reported when they are of sufficient importance to have a material effect on the market. Prices quoted in these columns apply to large quantities in original packages.

General Chemicals

Acetone, drums	lb.	$0.25 –	$0.25½
Acetic anhydride, 85%, dr.	lb.	.38 –	....
Acid, acetic, 28%, bbl.	100 lb.	3.38 –	3.63
Acetic, 56%, bbl.	100 lb.	6.75 –	7.00
Acetic, 80%, bbl.	100 lb.	9.58 –	9.83
Glacial, 99½%, bbl.	100 lb.	12.00 –	12.78
Boric, bbl.	lb.	.10 –	....
Citric, kegs	lb.	.48½–	.49½
Formic, 85%	lb.	.12 –	.14
Gallic, tech.	lb.	.45 –	.50
Hydrofluoric, 52%, carboys	lb.	.11 –	.12
Lactic, 44%, tech., light, bbl.	lb.	.11½–	.12
22% tech., light, bbl.	lb.	.05½–	.06
Muriatic, 18° tanks	100 lb.	.90 –	1.00
Muriatic, 20°, tanks	100 lb.	1.00 –	1.10
Nitric, 36°, carboys	lb.	.04½–	.05
Nitric, 42°, carboys	lb.	.05½–	.05½
Oleum, 20%, tanks	ton	18.50 –	19.00
Oxalic, crystals, bbl.	lb.	.11½–	.12
Phosphoric, 50% carboys	lb.	.07½–	.08½
Pyrogallic, resublimed	lb.	1.50 –	1.60
Sulphuric, 60°, tanks	ton	9.00 –	11.00
Sulphuric, 60°, drums	ton	13.00 –	14.00
Sulphuric, 66°, tanks	ton	15.00 –	16.00
Sulphuric, 66° drums	ton	20.00 –	21.00
Tannic, U.S.P., bbl.	lb.	.65 –	.70
Tannic, tech., bbl.	lb.	.45 –	.50
Tartaric, imp., powd., bbl.	lb.	.29 –	.30
Tartaric, domestic, bbl.	lb.	.32½–	....
Tungstic, per lb.	lb.	1.10 –	1.20
Alcohol, butyl, drums, f.o.b. works	lb.	.26 –	.28
Alcohol ethyl (Cologne spirit), bbl.	gal.	4.77 –	....
Ethyl, 190p'f. U.S.P., bbl.	gal.	4.74 –	....
Alcohol, methyl (see Methanol)			
Alcohol, denatured, 190 proof			
No. 1, special bbl.	gal.	.47½–	...
No. 1, 190 proof, special, dr.	gal.	.41½–	...
No. 1, 188 proof, bbl.	gal.	.48½–	...
No. 1, 188 proof, dr.	gal.	.42½–	...
No. 5, 188 proof, bbl.	gal.	.46½–	...
No 5, 188 proof, dr.	gal	.40½–	...
Alum, ammonia, lump, bbl.	lb.	.03½–	.04
Potash, lump, bbl.	lb.	.03 –	.03½
Chrome, lump, potash, bbl.	lb.	.05½–	.06½
Aluminum sulphate, com., bags	100 lb.	1.40 –	1.50
Iron free bags	lb.	2.40 –	2.50
Aqua ammonia, 26°, drums	lb.	.07 –	.07½
Ammonia, anhydrous, cyl.	lb.	.30 –	.30½
Ammonium carbonate, powd. tech., casks	lb.	.09 –	.09½
Ammonium nitrate, tech., casks	lb.	.09 –	.10
Amyl acetate tech., drums	gal.	4.50 –	4.75
Antimony Sulphuret, golden	lb.	.19 –	.20
Arsenic, white, powd., bbl.	lb.	.14 –	.14½
Arsenic, red, powd., kegs	lb.	.15 –	.15½
Barium carbonate, bbl.	ton	68.00 –	69.00
Barium chloride, bbl.	ton	83.00 –	90.00
Barium dioxide, 88%, drums	lb.	.17½–	.18
Barium nitrate, casks		.07½–	.08
Blanc fixe, dry, bbl.	lb.	.04 –	.04½
Bleaching powder, f.o.b. wks., drums	100 lb.	1.50 –	....
Spot N. Y. drums	100 lb.	2.00 –	2.10
Borax, bbl.	lb.	.05½–	.05½
Bromine, cases	lb.	.28 –	.30
Calcium acetate, bags	100 lb.	4.00 –	4.05
Calcium arsenate, dr.	lb.	.15 –	.18
Calcium carbide, drums	lb.	.05 –	.05½
Calcium chloride, fused, dr. wks.	ton	21.00 –	....
Gran. drums works	ton	27.00 –	....
Calcium phosphate, mono, bbl.	lb.	.06½–	.07
Camphor, cases	lb.	.85 –	.86
Carbon bisulphide, drums	lb.	.06 –	.06½
Carbon tetrachloride, drums	lb.	.09 –	.09½
Chalk, precip.—domestic, light, bbl.	lb.	.04½–	.04½
Domestic, heavy, bbl.	lb.	.03½–	.04
Imported, light, bbl.	lb.	.04½–	.05
Chlorine, liquid, tanks, wks.	lb.	.04 –	.04½
Cylinders, 100 lb., wks.	lb.	.05½–	.06
Cylinders, 100 lb., spot	lb.	.08½–	.09
Chloroform, tech., drums	lb.	.30 –	.32
Cobalt, oxide, bbl.	lb.	2.10 –	2.25
Copperas, bulk, f.o.b. wks.	ton	21.00 –	24.00
Copper carbonate, bbl.	lb.	.18 –	.19
Copper cyanide, drums	lb.	.47 –	.50
Copper sulphate, dom., bbl.	100 lb.	4.80 –	4.90
Imp bbl.	100 lb.	4.40 –	4.50
Cream of tartar, bbl.	lb.	.23½–	.25½
Epsom salt, dom., tech., bbl.	100 lb.	1.75 –	2.00
Epsom salt, imp., tech., bags	100 lb.	1.00 –	....
Epsom salt, U.S.P., dom., bbl.	100 lb.	2.25 –	2.50
Ether, U.S.P., resale, dr.	lb.	.13 –	.15
Ethyl acetate, 85%, drums	gal.	.92 –	.95
Ethyl acetate, 100%, dr.	gal.	$1.05 –	$1.10
Formaldehyde, 40%, bbl.	lb.	.11 –	.11½
Fullers earth—f.o.b. mines	ton	18.00 –	20.00
Fusel oil, ref., drums	gal.	... –	....
Fusel oil, crude, drums	gal.	4.25 –	....
Glaubers salt, wks., bags	100 lb.	1.20 –	1.40
Glaubers salt, imp., bags	100 lb.	.90 –	.95
Glycerine, e.p., drums extra	lb.	.17 –	....
Glycerine, dynamite, drums	lb.	.16½–	.16½
Glycerine, crude 80%, loose	lb.	.10½–	.11
Iron oxide, red, casks	lb.	.12 –	.18
Lead:			
White, basic carbonate, dry, casks	lb.	.09½–	.09½
White, basic sulphate, casks	lb.	.08½–	.09
White, in oil, kegs	lb.	.11½–	.11½
Red, dry, casks	lb.	.10½–	.10½
Red, in oil, kegs	lb.	.13 –	.14½
Lead acetate, white crys., bbl.	lb.	.14 –	.14½
Brown, broken, casks	lb.	.13 –	.13½
Lead arsenate, powd., bbl.	lb.	.18 –	.20
Lime-Hydrated, bg, wks.	ton	10.50 –	12.50
Bbl., wks.	ton	18.00 –	19.00
Lime, Lump, bbl.	280 lb.	3.63 –	3.65
Litharge, comm., casks	lb.	.10½–	.10½
Lithopone, bags	lb.	.07 –	.07½
in bbl.	lb.	.07½–	.07½
Magnesium carb., tech., bags	lb.	.08 –	.08½
Methanol, 95%, bbl.	gal.	.93 –	....
Methanol, 97%, bbl.	gal.	.95 –	....
Methyl-acetone, t'ks.	gal.	1.15 –	....
Nickel salt, double, bbl.	lb.	.10½–	....
Nickel salts, single, bbl.	lb.	.11½–	....
Phosgene		.60 –	.75
Phosphorus, red, cases	lb.	... –	....
Phosphorus, yellow, cases	lb.	.35 –	.40
Potassium bichromate, casks	lb.	.09½–	.09¾
Potassium bromide, gran., bbl.	lb.	.19 –	.20
Potassium carbonate, 80-85%, calcined, casks	lb.	.06½–	.06½
Potassium chlorate, powd.	lb.	.07½–	.08½
Potassium cyanide, drums	lb.	.47 –	.52
Potassium, first sorts, cask	lb.	.07½	.07¾
Potassium hydroxide (caustic potash) drums	lb.	.06¾–	.07
Potassium iodide, cases	lb.	3.65 –	3.75
Potassium nitrate, bbl.	lb.	.07½–	.09
Potassium permanganate, drums	lb.	.17½	.18
Potassium prussiate, red, casks	lb.	.60 –	.63
Potassium prussiate, yellow, casks	lb.	.26 –	.28
Salammoniac, white, gran., casks, imported	lb.	.06½–	....
Salammoniac, white, gran., bbl., domestic	lb.	.07½–	.07½
Gray, gran., casks	lb.	.08 –	.09
Salsoda, bbl.	100 lb.	1.20	1.40
Salt cake (bulk)	ton	22.00 –	23.00
Soda ash, light, 58% flat, bulk, contract	100 lb.	1.25 –	....
bags, contract	100 lb.	1.38 –	....
Soda ash, dense, bulk, contract, basis 58%	100 lb.	1.35 –	....
bags, contract	100 lb.	1.45 –	....
Soda, caustic, 76%, solid, drums contract	100 lb.	3.10 –	....
Soda, caustic, ground and flake, contracts, dr.	100 lb.	3.50 –	3.85
Soda, caustic, solid, 76% f. a. s. N. Y.	100 lb.	3.00 –	3.10
Sodium acetate, works, bbl.	lb.	.05½–	.05½
Sodium bicarbonate, bulk	100 lb.	1.75 –	....
330-lb. bbl.	100 lb.	2.00 –	....
Sodium bichromate, casks	lb.	.07½–	.07½
Sodium bisulphate (niter cake)	ton	6.00 –	7.00
Sodium bisulphite, powd., U.S.P., bbl.	lb.	.04½–	.04½
Sodium chlorate, kegs	lb.	.06½–	.07
Sodium chloride	long ton	12.00 –	13.00
Sodium cyanide, cases	lb.	.19 –	.22½
Sodium fluoride, bbl.	lb.	$0.08½–	$0.10½
Sodium hyposulphite, bbl.	lb.	.02½–	.02½
Sodium nitrite, casks	lb.	.07½–	....
Sodium peroxide, powd., cases	lb.	.28 –	.30
Sodium phosphate, dibasic, bbl.	lb.	.03½–	.04
Sodium prussiate, yel. drums	lb.	.13 –	.13½
Sodium salicylic, drums	lb.	.40 –	.42
Sodium silicate (40°, drums)	100 lb.	.75 –	1.15
Sodium silicate (60°, drums)	100 lb.	1.75 –	2.00
Sodium sulphide, fused, 60-62% drums	lb.	.03 –	.04
Sodium sulphite, crys., bbl.	lb.	.03½–	.03½
Strontium nitrate, powd., bbl.	lb.	.11½–	.12
Sulphur chloride, yel drums	lb.	.04½–	.05
Sulphur, crude	ton	18.00 –	20.00
At mine, bulk	ton	16.00 –	18.00
Sulphur, flour, bag	100 lb.	2.25 –	2.35
Sulphur, roll, bag	100 lb.	2.00 –	2.10
Sulphur dioxide, liquid, cyl.	lb.	.08 –	.08½
Tin bichloride, bbl.	lb.	.12½–	.13
Tin oxide, bbl.	lb.	.47 –	....
Tin crystals, bbl.	lb.	.32 –	.32½
Zinc carbonate, bags	lb.	.14 –	.14½
Zinc chloride, gran, bbl.	lb.	.06½–	.06½
Zinc cyanide, drums	lb.	.37 –	.38
Zinc oxide, , lead free, bbl.	lb.	.08 –	.08½
5% lead sulphate, bags	lb.	.07½–	....
10 to 35 % lead sulphate, bags	lb.	.07 –	....
French, red seal, bags	lb.	.09½–	....
French, green seal, bags	lb.	.10½–	....
French, white seal, bbl.	lb.	.12 –	....
Zinc sulphate, bbl.	100 lb.	2.75 –	3.25

Coal-Tar Products

Alpha-naphthol, crude, bbl.	lb.	$0.60 –	$0.70
Alpha-naphthol, ref., bbl.	lb.	.65 –	.80
Alpha-naphthylamine, bbl.	lb.	.35 –	.36
Aniline oil, drums	lb.	.16 –	.16½
Aniline salts, bbl.	lb.	.23 –	.23½
Anthracene, 80%, drums	lb.	.75 –	.80
Anthracene, 80%, imp., drums, duty paid	lb.	.65 –	.70
Anthraquinone, 25%, paste, drums	lb.	.80 –	.85
Benzaldehyde U.S.P., carboys	lb.	1.50 –	....
f.f.c. drums	lb.	1.60 –	....
tech, drums	lb.	.75	....
Benzene, pure, water-white, tanks, works	gal.	.23 –	....
Benzene, 90%, tanks, works	gal.	.21 –	....
Benzidine base, bbl.	lb.	.80 –	.85
Benzidine sulphate, bbl.	lb.	.75 –	....
Benzoic acid, U.S.P., kegs	lb.	.80 –	80
Benzoate of soda, U.S.P., bbl.	lb.	.65 –	.70
Benzyl chloride, 95-97%, ref., drums	lb.	.45 –	....
Benzyl chloride, tech., drums	lb.	.30 –	.35
Beta-naphthol, tech., bbl.	lb.	.21 –	.22
Beta-naphthylamine, tech.	lb.	.75 –	.80
Cresol, U.S.P., drums	lb.	.25 –	.29
Ortho-cresol, drums	lb.	.28 –	.32
Cresylic acid, 97%, works drums	gal.	.75 –	.85
95-97%, drums, works	gal.	.70 –	.75
Dichlorbenzene, drums	lb.	.06 –	.08
Diethylaniline, drums	lb.	.50 –	.60
Dimethylaniline, drums	lb.	.40 –	.41
Dinitrobenzene, bbl.	lb.	.19 –	.20
Dinitrochlorbenzene, bbl.	lb.	.21 –	.22
Dinitronaphthalen, bbl.	lb.	.30 –	.32
Dinitrophenol, bbl.	lb.	.35 –	.40
Dinitrotoluen, bbl.	lb.	.20 –	.22
Dip oil, 25%, drums	gal.	.25 –	.30
Diphenylamine, bbl.	lb.	.50 –	.52
H-acid, bbl.	lb.	.75 –	.80
Meta-phenylenediamine, bbl.	lb.	1.00 –	1.05
Michlers ketone, bbl.	lb.	3.00 –	3.50
Monochlorbenzene, drums	lb.	.08 –	.10
Monoethylaniline, drums	lb.	.95 –	1.10
Naphthalene, flake, bbl.	lb.	.06 –	.06½
Naphthalene, balls, bbl.	lb.	.06½–	.07
Naphthionate of soda, bbl.	lb.	.60 –	.65
Naphthionic acid, crude, bbl.	lb.	.55 –	.60
Nitrobenzene, drums	lb.	.09½–	.10½
Nitro-naphthalene, bbl.	lb.	.30 –	.35
Nitro-toluene, drums	lb.	.13½–	.14½
N-W acid, bbl.	lb.	1.10 –	1.20
Ortho-amidophenol, kegs	lb.	2.30 –	2.35
Ortho-dichlorbenzene, drums	lb.	.15 –	.17
Ortho-nitrophenol, bbl.	lb.	1.20 –	1.30
Ortho-nitrotoluene, drums	lb.	.10 –	.12
Ortho-toluidine, bbl.	lb.	.17 –	.18
Para-amifiophenol, base, kegs	lb.	1.30 –	....
Para-amifiophenol, HCl, kegs	lb.	1.55 –	....
Para-dichlorbenzene, bbl.	lb.	.17 –	.20
Paranitroaniline, bbl.	lb.	.72 –	.75
Para-nitrotoluene, bbl.	lb.	.60 –	.65
Para-phenylenediamine, bbl.	lb.	1.45 –	1.50
Para-toluidine, bbl	lb.	.90 –	.95
Phthalic anhydride, bbl.	lb.	.30 –	.34
Phenol, U.S.P., dr.	lb.	.25 –	.26
Picric acid, bbl.	lb.	.20 –	.22
Pyridine, dom., drums	gal.	nominal	
Pyridine, imp., drums	gal.	5.75 –	6.00
Resorcinol, tech., kegs	lb.	1.40 –	1.50

Resorcinol, pure, kegs	lb.	$2.15 –	$2.25
R-salt, bbl.	lb.	.55 –	.60
Salicylic acid, tech., bbl.	lb.	.32 –	....
Salicylic acid, U.SP., bbl.	lb.	.35 –	....
Solvent naphtha, water-white, tanks	gal.	.23 –	....
Crude, tanks	gal.	.20 –	....
Sulphanilic acid, crude, bbl.	lb.	.18 –	.20
Thiocarbanilide, kegs	lb.	.35 –	.38
Tolidine, bbl	lb.	1.00 –	1.05
Toluidine, mixed, kegs	lb.	.30 –	.35
Toluene, tank cars, works	gal.	.24 –	....
Toluene, drums, works	gal.	.29 –	....
Xylidine drums	lb.	.50 –	....
Xylene, pure, drums	gal.	.50 –	.55
Xylene, com., drums	gal.	.34 –	....
Xylene, com., tanks	gal.	.29 –	....

Naval Stores

Rosin B-D, bbl.	280 lb.	$5.80 –	....
Rosin E-I, bbl.	280 lb.	5.80 –	....
Rosin K-N, bbl.	280 lb.	5.85 –	$6.10
Rosin W.G.-W.W., bbl.	280 lb.	6.50 –	7.00
Wood rosin bbl.	280 lb.	5.50 –	6.00
Turpentine, spirits of, bbl.	gal.	.98 –	....
Wood, steam dist., bbl.	gal.	.90 –	....
Wood, dest. dist., bbl.	gal.	.75 –	....
Pine tar pitch, bbl.	200 lb.	5.50 –	....
Tar, kiln burned, bbl.	500 lb.	11.00 –	....
Retort tar, bbl.	500 lb.	11.00 –	....
Rosin oil, first run, bbl.	gal.	.45 –	....
Rosin oil, second run, bbl.	gal.	.47 –	....
Rosin oil, third run, bbl.	gal.	.50 –	....
Pine oil, steam dist.	gal.	.65 –	....
Pine oil, pure, dest. dist.	gal.	.60 –	....
Pine tar oil, ref.	gal.	.48 –	....
Pine tar oil, crude, tanks f.o.b. Jacksonville, Fla.	gal.	.32 –	.32½
Pine tar oil, double ref., bbl.	gal.	.... –	.75
Pine tar, ref., thin, bbl.	gal.	.... –	.25
Pinewood creosote, ref., bbl.	gal.	.... –	.52

Animal Oils and Fats

Degras, bbl.	lb.	$0.04 –	$0.04½
Grease yellow, bbl.	lb.	.06½ –	.06¾
Lard oil, Extra No. 1, bbl.	gal.	.86 –	.88
Neatsfootoil 20 deg. bbl.	gal.	1.30 –	....
No. 1 bbl.	gal.	.94 –	.96
Oleo Stearine	lb.	.11½ –	.11¾
Oleo oil, No. 1, bbl.	lb.	.14½ –	.15
Red oil, distilled, d.p. bbl.	lb.	.08½ –	.08¾
Saponified, bbl.	lb.	.08½ –	.08¾
Tallow, extra, loose	lb.	.08 –	....
Tallow oil, acidless, bbl.	gal.	.86½	.87

Vegetable Oils

Castor oil, No. 3, bbl.	lb.	$0.13 –	....
Castor oil, No. 1, bbl.	lb.	.13½ –	....
Chinawood oil, bbl.	lb.	.20½ –	.21½
Coconut oil, Ceylon, bbl.	lb.	.09¾ –	.10
Ceylon, tanks, N.Y.	lb.	.08¼ –	.08¾
Coconut oil, Cochin, bbl.	lb.	.10¼ –	.10¾
Corn oil, crude, bbl.	lb.	.11¼ –	.11¾
Crude, tanks, (f.o.b. mill)	lb.	.10 –	....
Cottonseed oil, crude (f.o.b. mill), tanks	lb.	.10 –	....
Summer yellow, bbl.	lb.	.12½ –	....
Winter yellow, bbl.	lb.	.13½ –	.13¾
Linseed oil, raw, car lots, bbl.	gal.	.92 –	....
Raw, tank cars (dom.)	gal.	.86 –	....
Boiled, cars, bbl. (dom.)	gal.	.94 –	....
Olive oil, denatured, bbl.	gal.	1.10 –	1.12
Sulphur, (foots) bbl.	lb.	.08¼ –	.08¾
Palm, Lagos, casks	lb.	.07¾ –	....
Niger casks	lb.	.07¼ –	....
Palm kernel, bbl.	lb.	.08¼ –	.08¾
Peanut oil, crude, tanks (mill)	lb.	.13 –	....
Peanut oil, refined, bbl.	lb.	.14½ –	....
Perilla, bbl	lb.	.14¼ –	.14½
Rapeseed oil, refined, bbl.	gal.	.74 –	.75
Rapeseed oil, blown, bbl.	gal.	.82 –	....
Sesame, bbl.	lb.	.12½ –	.12¾
Soya bean (Manchurian), bbl.	lb.	.11 –	....
Tank, f.o.b. Pacific coast	lb.	.09½ –	....
Tank, (f.o.b. N.Y.)	lb.	.10¼ –	.10½

Fish Oils

Cod, Newfoundland, bbl.	gal.	$0.66 –	$0.68
Menhaden, light pressed, bbl.	gal.	.63 –	....
White bleached, bbl.	gal.	.65 –	....
Blown, bbl.	gal.	.70 –	....
Crude, tanks (f.o.b. factory	gal.	.47½ –	.50
Whale No. 1 crude, tanks, coast	lb.	.... –	....
Winter, natural, bbl.	gal.	.75 –	.76
Winter, bleached, bbl.	gal.	.78 –	.79

Oil Cake and Meal

Coconut cake, bags	ton	$32.00 –	$33.00
Copra, sun dried, bags, (c.i.f.)	lb.	.05¼ –	....
Sun dried Pacific coast	lb.	.04½ –	....
Cottonseed meal, f.o.b. mills	ton	40.00 –	41.00
Linseed cake, bags	ton	40.00 –	....
Linseed meal, bags	ton	44.00 –	....

Dye & Tanning Materials

Albumen, blood, bbl.	lb.	$0.45 –	$0.50
Albumen, egg, tech, kegs	lb.	.95 –	.97
Cochneal, bags	lb.	.32 –	.34
Cutch, Borneo, bales	lb.	.04 –	.04½
Cutch, Rangoon, bales	lb.	.15 –	.16
Dextrine, corn, bags	100 lb.	4.14 –	4.19
Dextrine gum, bags	100 lb.	4.44 –	4.71
Divi-divi, bags	ton	38.00 –	39.00
Fustic, sticks	ton	30.00 –	35.00
Fustic, chips, bags	lb.	.04 –	.05
Gambier com. cs.	lb.	.08½ –	.09
Logwood, sticks	ton	25.00 –	26.00
Logwood, chips, bags	lb.	.02½ –	.03
Sumac, leaves, Sicily, bags	ton	80.00 –	85.00
Sumac, ground, bags	ton	$75.00 –	$80.00
Sumac, domestic, bags	ton	40.00 –	42.00
Starch, corn, bags	100 lb.	3.57 –	3.67
Tapioca flour, bags	lb.	.07 –	.07½

Extracts

Archil, conc., bbl.	lb.	$0.16½ –	$0.20
Chestnut, 25% tannin, tanks	lb.	.02 –	.03
Divi-divi, 25% tannin, bbl.	lb.	.04 –	.05
Fustic, crystals, bbl.	lb.	.20 –	.22
Fustic, liquid, 42°, bbl.	lb.	.08 –	.09
Gambier, liq., 25% tannin, bbl.	lb.	.09 –	.09½
Hematine crys., bbl.	lb.	.14 –	.18
Hemlock, 25% tannin, bbl.	lb.	.03½ –	.04
Hypernic, solid, drums	lb.	.24 –	.26
Hypernic, liquid, 51°, bbl.	lb.	.09½ –	.10½
Logwood, crys., bbl.	lb.	.14 –	.15
Logwood, liq., 51°, bbl.	lb.	.07½ –	.08
Quebracho, solid, 65% tannin, bbl.	lb.	.04½ –	.05
Sumac, dom., 51°, bbl.	lb.	.06½ –	.07½

Dry Colors

Blacks–Carbongas, bags, f.o.b. works, spot	lb.	$0.14 –	$0.18
Lampblack, bbl.	lb.	.12 –	.40
Mineral, bulk	ton	35.00 –	45.00
Blues–Bronze, bbl.	lb.	.45 –	.50
Prussian, bbl.	lb.	.45 –	.50
Ultramarine, bbl.	lb.	.08 –	.35
Browns, Sienna, Ital., bbl.	lb.	.06 –	.14
Sienna, Domestic, bbl.	lb.	.03½ –	.04
Umber, Turkey, bbl.	lb.	.04 –	.04½
Greens–Chrome, C.P.Light, bbl.	lb.	.28 –	.30
Chrome, commercial, bbl.	lb.	.12 –	.12½
Paris, bulk	lb.	.28 –	.30
Reds Carmine No. 40, tins	lb.	4.50 –	4.70
Oxide red, casks	lb.	.10 –	.14
Para toner, kegs	lb.	1.00 –	1.10
Vermilion, English, bbl.	lb.	1.15 –	1.20
Yellow, Chrome, C.P. bbls.	lb.	.17 –	....
Ocher, French, casks	lb.	.02½ –	.03

Waxes

Bayberry, bbl.	lb.	$0.25 –	$0.26
Beeswax, crude, Afr. bg.	lb.	.21½ –	.22
Beeswax, refined, light, bags	lb.	.32 –	.34
Beeswax, pure white, cases	lb.	.40 –	.41
Candellila, bags	lb.	.23½ –	.24
Carnauba, No. 1, bags	lb.	.36 –	.38
No. 2, North Country, bags	lb.	.23½ –	.24
No. 3, North Country, bags	lb.	.16½ –	.17
Japan, cases	lb.	.16½ –	.16¾
Montan, crude, bags	lb.	.05 –	....
Paraffine, crude, match, 105-110 m.p., bbl.	lb.	.04½ –	.04¾
Crude, scale 124-126 m.p. bags	lb.	.03 –	....
Ref., 118-120 m.p., bags	lb.	.03½ –	....
Ref., 125 m.p., bags	lb.	.03¾ –	....
Ref. 128-130 m.p., bags	unit	4.40 –	4.60
Ref., 133-135 m.p., bags	lb.	.04½ –	.04¾
Ref., 135-137 m.p., bags	lb.	.05½ –	.05¾
Stearic acid, sgle pressed, bags	lb.	.12½ –	.12¾
Double pressed, bags	lb.	.13 –	.13½
Triple pressed, bags	lb.	.14½ –	.14¾

Fertilizers

Ammonium sulphate, bulk f.o.b. works	100 lb.	$3.20 –	$3.25
F.a.s. double bags	100 lb.	3.40 –	3.50
Blood, dried, bulk	unit	4.40 –	4.60
Bone, raw, 3 and 50, ground	ton	28.00 –	30.00
Fish scrap, dom., dried, wks.	unit	.... –	....
Nitrate of soda, bags	100 lb.	2.45 –	2.52½
Tankage, high grade, f.o.b. Chicago	unit	3.25 –	3.35
Phosphate rock, f.o.b. mines, Florida pebble, 68-72%	ton	4.00 –	4.50
Tennessee, 78-80%	ton	7.75 –	8.00
Potassium muriate, 80%, bags	ton	34.55 –	....
Potassium sulphate, bags basis 90%	ton	43.67 –	....
Double manure salt	ton	25.72 –	....
Kainit	ton	7.22 –	....

Crude Rubber

Para—Upriver fine	lb.	$0.21½ –	....
Upriver coarse	lb.	.18 –	....
Upriver caucho ball	lb.	.19 –	....
Plantation—First latex crepe	lb.	.27½ –	....
Ribbed smoked sheets	lb.	.27½ –	....
Brown crepe, thin, clean	lb.	.25½ –	....
Amber crepe No. 1	lb.	.26 –	....

Gums

Copal, Congo, amber, bags	lb.	$0.10 –	$0.15
East Indian, bold, bags	lb.	.21 –	.22
Manila, pale, bags	lb.	.19 –	.20
Pontinak, No. 1 bags	lb.	.19 –	.20
Damar, Batavia, cases	lb.	.25 –	.25½
Singapore, No. 1, cases	lb.	.32 –	.33
Singapore, No. 2, cases	lb.	.21½ –	.22
Kauri, No. 1, cases	lb	.64 –	.66
Ordinary chips, cases	lb.	.21 –	.23
Manjak, Barbados, bags	lb.	.09 –	.14

Shellac

Shellac, orange fine, bags	lb.	$0.64 –	$0.65
Orange superfine, bags	lb.	.66 –	.67
A. C. garnet, bags	lb.	.65 –	....
Bleached, bonedry	lb.	.72 –	.73
Bleached, fresh	lb	.60 –	....
T. N., bags	lb.	.61 –	....

Miscellaneous Materials

Asbestos, crude No. 1, f.o.b. Quebec	sh. ton	$325.00 –	$450.00
Asbestos, shingle, f.o.b., Quebec	sh. ton	$55.00 –	$60.00
Asbestos, cement, f.o.b., Quebec	sh. ton	20.00 –	25.00
Barytes, grd., white, f.o.b. mills, bbl.	net ton	15.00 –	18.00
Barytes, grd., off-color, f.o.b. Balt.	net ton	12.00 –	14.00
Barytes, floated, f.o.b. St. Louis, bbl.	net ton	28.00 –	....
Barytes, crude f.o.b. mines, bulk	net ton	8.00 –	10.00
Casein, bbl., tech.	lb.	.15 –	.16
China clay (kaolin) crude, f.o.b. Ga.	net ton	6.00 –	8.00
Washed, f.o.b. Ga.	net ton	8.00 –	9.00
Powd., f.o.b. Ga.	net ton	14.00 –	20.00
Crude f.o.b. Va.	net ton	6.00 –	8.00
Ground, f.o.b. Va.	net ton	13.00 –	19.00
Imp., lump, bulk	net ton	15.00 –	20.00
Imp., powd.	net ton	45.00 –	50.00
Feldspar, No. 1 pottery	long ton	7.00 –	8.00
No. 2 pottery	long ton	6.00 –	....
No. 1 soap	long ton	8.50 –	....
No. 1 Canadian, f.o.b. mill, powd.	long ton	20.00 –	....
Graphite, Ceylon, lump, first quality, bbl.	lb.	.06 –	.06½
Ceylon, chip, bbl.	lb.	.04½ –	.05
High grade amorphous crude	ton	15.00 –	30.00
Gum arabic, amber, sorts, bags	lb.	.13½ –	.14
Gum tragacanth, sorts, bags	lb.	.50 –	.55
No. 1, bags	lb.	1.40 –	1.45
Kieselguhr, f.o.b. Cal.	ton	40.00 –	42.00
F.o.b. N.Y.	ton	50.00 –	55.00
Magnesite, crude, f.o.b. Cal.	ton	14.00 –	15.00
Pumice stone, imp., casks	lb.	.03 –	.05½
Dom., lump, bbl.	lb.	.05 –	.05½
Dom., ground, bbl.	lb.	.05½ –	.06
Silica, glass sand, f.o.b. Ind.	ton	2.00 –	2.50
Silica, sand blast, f.o.b. Ind.	ton	2.50	5.00
Silica, amorphous, 200-mesh, f.o.b. Ill.	ton	20.00 –	....
Silica, glass sand, f.o.b. Ill.	ton	1.50 –	3.00
Soapstone, coarse, f.o.b. Vt., bags	ton	7.00 –	8.00
Talc, 200 mesh, f.o.b., Vt., bags, extra	ton	6.50 –	8.50
Talc, 200 mesh, f.o.b. Ga., bags	ton	7.00 –	9.00
Talc, 350 mesh, f.o.b. New York, grade A bags	ton	22.00 –	....

Mineral Oils

Crude, at Wells

Pennsylvania	bbl.	$2.50 –	2.75
Corning	bbl.	1.45 –	....
Cabell	bbl.	1.35 –	....
Somerset	bbl.	1.25 –	....
Illinois	bbl.	1.47 –	....
Indiana	bbl.	1.48 –	....
Kansas and Oklahoma, 28 deg.	bbl.	.50 –	....
California, 35 deg. and up	bbl.	.76 –	....

Gasoline, Etc.

Motor gasoline, steel bbls.	gal.	$0.16½ –	....
Naphtha, V. M. & P. deod, steel bbls.	gal	.15½ –	....
Kerosene, ref. tank wagon	gal.	.14 –	....
Bulk, W.W. delivered, N.Y.	gal.	.06 –	....
Lubricating oils:			
Cylinder, Penn., dark	gal.	.22½ –	....
Bloomless, 30@31 grav.	gal.	.17½ –	....
Paraffin, pale	gal.	.16 –	.17
Spindle, 200, pale	gal.	.20 –	.20½
Petrolatum, amber, bbls.	lb.	.03½ –	.04
Paraffine wax (see waxes)			

Refractories

Bauxite brick, 56% Al_2O_3, f.o.b. Pittsburgh	1,000	$140–145
Chrome brick, f.o.b. Eastern shipping points	ton	50–52
Chrome cement, 40-50% Cr_2O_3	ton	23–27
40-45% Cr_2O_3, sacks, f.o.b. Eastern shipping points	ton	23.00
Fireclay brick, 1st. quality, 9-in. shapes, f.o.b. Ky. wks.	1,000	42 45
2nd. quality, 9-in. shapes, f.o.b. wks.	1,000	35–38
Magnesite brick, 9-in. straight (f.o.b. wks.)	ton	65–68
9-in. arches, wedges and keys	ton	80–85
Scraps and splits	ton	85
Silica brick, 9-in. sizes, f.o.b. Chicago district	1,000	50–53
Silica brick, 9-in. sizes, f.o.b. Birmingham district	1,000	50–53
F.o.b. Mt. Union, Pa.	1,000	42–45
Silicon carbide refract. brick, 9-in.	1,000	950.00

Ferro-Alloys

Ferrotitanium, 15-18% f.o.b. Niagara Falls, N.Y.	ton	$200.00 –	$225.00
Ferrochromium, per lb. of Cr, 1-2% C	lb.	.28 –	.30
4-6% C	lb.	.12 –	....
Ferromanganese, 78-82% Mn, Atlantic seabd. duty paid	gr. ton	110.00 –	....
Spiegeleisen, 19-21% Mn	gr. ton	42.00 –	45.00
Ferromolybdenum, 50-60% Mo, per lb Mo	lb.	2.00 –	2.50
Ferrosilicon, 10-12%	gr. ton	43.00 –	50.00
50%	gr. ton	82.50 –	85.00

Ferrotungsten, 70-80%, per lb. of W	lb.	$0.88 @ $0.90
Ferro-uranium, 35-50% o f U. per lb. of U	lb.	4.50 - ....
Ferrovanadium, 30-40%, per lb. of V	lb.	3.50 - 4.50

Ores and Semi-finished Products

Bauxite, dom. crushed dried, f.o.b. shipping points	ton	$5.50 - $8.75
Chrome ore, Calif. concentrates, 50% min. Cr_2O_3	ton	22.00 - 23.00
C.i.f. Atlantic seaboard	ton	19.50 - 21.50
Coke, fdry., f.o.b. ovens	ton	5.00 - 5.50
Coke, furnace, f.o.b. ovens	ton	3.75 - 4.00
Fluorspar, gravel, f.o.b. mines' Illinois	ton	23.50 -.....
Ilmenite, 52% TiO_2	lb.	.00½- .01
Manganese ore, 50% Mn c.i.f. Atlantic seaport	unit	.39 - .42
Manganese ore, chemical (MnO_2)	ton	75.00 - 80.00
Molybdenite, 85% MoS_2, per lb. MoS_2, N. Y.	lb.	.75 -.....
Monazite, per unit of ThO_2, c.i.f., Atl. seaport	lb.	.06 - .08
Pyrites, Span., fines, c.i.f Atl. seaport	unit	.11½- .12
Pyrites, Span., furnace size c.i.f. Atl. seaport	unit	.11½- .12
Pyrites, dom. fines, f.o.b. mines, Ga.	unit	.12 -.....
Rutile, 95% TiO_2	lb.	.10 -.....
Tungsten, scheelite, 60% WO_3 and over	unit	9.50 - 10.00
Tungsten, wolframite, 60% WO_3	unit	8.50 - 9.00
Uranium ore (carnotite) per lb. of U_3O_8	lb.	3.50 - 3.75
Uranium oxide, 96% per lb. U_3O_8	lb.	2.25 - 2.50
Vanadium pentoxide, 99%	lb.	12.00 - 14.00
Vanadium ore, per lb. V_2O_5	lb.	.75 - 1.00
Zircon	ton	80.00 -.....

Non-Ferrous Materials

	Cents per Lb.
Copper, electrolytic	12½
Aluminum, 98 to 99%	25-27
Antimony, wholesale, Chinese and Japanese	9- 9½
Nickel, 99%	27-32
Monel metal, shot and blocks	32.00
Monel metal, ingots	38.00
Monel metal, sheet bars	45.00
Tin, 5-ton lots, Straits	41.85
Lead, New York, spot	6.75
Lead, E. St. Louis, spot	6.45
Zinc, spot, New York	6.67½
Zinc, spot, E. St. Louis	6.32½

Other Metals

Silver (commercial)	oz.	$0.63½
Cadmium	lb.	.80
Bismuth (500 lb. lots)	lb.	2.55
Cobalt	lb.	3.00-3.25
Magnesium, ingots, 99%	lb.	1.25-.....
Platinum	oz.	120.00
Iridium	oz.	275.00@300.00
Palladium	oz.	80.00
Mercury	75 lb.	62.00
Tungsten	lb.	.97-1.00

Finished Metal Products

	Warehouse Price Cents per Lb.
Copper sheets, hot rolled	19.25
Copper bottoms	29.75
Copper rods	19 75
High brass wire	18 00
High brass rods	15 75
Low brass wire	20.25
Low brass rods	20.50
Brazed brass tubing	23.50
Brazed bronze tubing	27.00
Seamless copper tubing	25.50
Seamless high brass tubing	24.00

OLD METALS—The following are the dealers' purchasing prices in cents per pound:

Copper, heavy and crucible	9.00@ 9.50
Copper, heavy and wire	10.25@10.50
Copper, light and bottoms	8.50@ 8.75
Lead, heavy	5.50@ 5.62½
Lead, tea	3.50@ 3.75
Brass, heavy	6.00@ 6.25
Brass, light	5.25@ 5.50
No. 1 yellow brass turnings	5.75@ 6.00
Zinc scrap	3.75@ 4.00

Structural Material

The following base prices per 100 lb. are for structural shapes 3 in. by ¼ in. and larger, and plates ¼ in. and heavier, from jobbers' warehouses in the cities named:

	New York	Chicago
Structural shapes	$3.54	$3.54
Soft steel bars	3.54	3.54
Soft steel bar shapes	3.54	3.54
Soft steel bands	4.39	4.39
Plates, ¼ to 1 in. thick	3 64	3.64

Industrial

Financial, Construction and Manufacturing News

Construction and Operation

Alabama

BESSEMER—The Hercules Powder Co., Wilmington, Del., has acquired a local tract of land, totaling more than 500 acres, and is reported to be planning for the erection of a new plant for the manufacture of powder and explosives.

BESSEMER—The Harbison-Walker Refractories Co., Farmers' Bank Bldg., Pittsburgh, Pa., will defer for a number of months the construction of its proposed firebrick and refractory plant on local site, lately purchased. It is expected to have plans completed in the spring of the coming year. The works will cost in excess of $500,000, with equipment.

BAYOU LABATRE—Tentative plans are under advisement by the Fish Products Corp. for the rebuilding of the portion of its local fertilizer-manufacturing plant, recently destroyed by fire with loss of about $25,000, including equipment.

California

BREA—The Union Oil Co., Union Oil Bldg., Los Angeles, is perfecting plans for the construction of a new oil storage and distributing plant in the vicinity of Brea, estimated to cost approximately $1,000,000, including machinery, tanks and operating equipment.

BEAUMONT—The Beaumont Fruit Evaporating Co. has preliminary plans under consideration for the rebuilding of the portion of its local plant, destroyed by fire, Oct. 9, with loss estimated at $35,000, including equipment.

SAN FRANCISCO—The Bass-Hueter Paint Co., 816 Mission St., has awarded a general contract to the Barrett & Hilp Co., 918 Harrison St., for the construction of a new 2-story addition to its present 4-story works at Kansas and 24th Sts., to cost about $23,000.

NATIONAL CITY—The Atchison, Topeka & Santa Fe Railway Co., Los Angeles, is perfecting plans for the construction of a new creosoting plant on local site, to cost about $275,000, including equipment. It will consist of a number of buildings, with cylinder room, power house, tank department, etc., and will be designed to utilize about 250,000 gal. of creosote per month. D. L. Murray is in charge.

ANTIOCH—The Paraffine Companies, Inc., 40 1st St., San Francisco, manufacturer of paraffine papers, boxboard, etc., has tentative plans under advisement for the rebuilding of the portion of its local mills, destroyed by fire, Oct. 15, with loss estimated in excess of $300,000, including buildings and equipment.

LOS ANGELES—Fire, Oct. 14, destroyed a large portion of the plant of the Pacific Coast Glass Co., Vernon Industrial District, with loss reported in excess of $250,000. Rebuilding plans are under consideration.

Connecticut

NEW HAVEN—The New Haven Pulp & Board Co., Greene St., has awarded a contract to the Dwight Building Co., New Haven, for extensions and improvements to cost about $25,000.

Florida

LEESBURG—The Florida Moss Products Co. has plans under way for extensions in its plant for large increase in output. Considerable additional machinery will be installed. The company has recently increased its capital to $150,000 for expansion.

Georgia

ATLANTA—The Nelstone Co. of Georgia, Inc., 509 Candler Bdlg., recently organized with a capital of $250,000, is perfecting plans for the construction of a new plant on local site for the manufacture of reinforced-concrete products under a special monolithic system. The main structure will be 1-story, 150x250 ft., and will be supplemented by a number of smaller buildings. Bids for equipment will be asked in Nov. The plant will cost close to $100 000. James A. Galloby is president, and R. L. Langston, general manager.

Illinois

CHICAGO—The Sterling Oil Works, Inc., 5433 Wabash Ave., has filed plans for the erection of a new 1-story addition to cost about $45,000. A general building contract has been let to J. B. Hughes, 7631 Ridgeland Ave. A. E. Blondin, 5 East Garfield Blvd., is architect.

CHICAGO—The Reade Mfg. Co., 195 Hoboken Ave., Jersey City, N. J., manufacturer of soldering compounds, chemical specialties for weed destruction, etc., has acquired a tract of 1 acre of land in the Clearing industrial section, and plans for the construction of a new branch plant. Work will be commenced in the near future.

CHICAGO—The Elliott Varnish Co., 1013 South Holman Ave., has filed plans and will commence the immediate erection of a new 2-story plant addition, 35x45 ft., estimated to cost approximately $95,000, including equipment. L. Simon, 111 South Dearborn St., is architect.

Indiana

ENGLISH—The Standard Oil Co. of Indiana, Indianapolis, will commence the construction of a new local storage and distributing plant, estimated to cost about $70,000, with equipment.

Iowa

CEDAR RAPIDS—Penick & Ford, Ltd., Whitney Bldg., New Orleans, La., manufacturer of starch and kindred products, has plans under way for the construction of a new addition to its local plant, estimated to cost about $75,000, including equipment.

DUBUQUE—The Globe Portland Cement Co., 416 McKnight Bldg., Minneapolis, Minn., will hold in abeyance the construction of its proposed new cement-manufacturing plant on local site, estimated to cost more than $1,500,000, with machinery, for which preliminary plans have been prepared by the Charles L. Pillsbury Co., 1200 2nd Ave., South, Minneapolis. It is likely that the project will proceed during the coming year.

Louisiana

MONROE—The Chester Carbon Co., 315 Ouachita National Bank Bldg., recently organized with a capital of $250,000, has plans under way for the construction of a new plant on local site for the manufacture of carbon black, to be equipped for an initial output of about 20,000 lb. per day. It is estimated to cost more than $200,000, with machinery. Arthur C Scott, Monroe, is engineer. L. B. Adams is secretary.

NEW ORLEANS—The Gulf States Oil Corp. has acquired the local refinery of the Island Oil & Transport Corp., as well as other property of the company, and plans for extensive operations. It is purposed to make improvements in the local plant and develop to a capacity basis at an early date.

Maryland

BALTIMORE—The Pan-American Petroleum & Transport Co., 120 Broadway, New York, has purchased a large interest in the American Oil Co., operating in the Curtis Bay section, and plans for the development of the property. The last noted company has acquired a tract of property adjoining its plant and is said to be planning for the construction of an addition. Louis Blaustein will continue as president of the American company.

BALTIMORE—The Baltimore Copper Smelting & Rolling Co., Canton section, is said to have completed plans for the purchase of the former Canton Distillery, Clinton St. and 4th Ave., and purposes to use the property for extensions in its plant.

Massachusetts

WEST LYNN—Fire, Oct. 19, destroyed a portion of the plant of the 4-story plant of the McDermott Leather Co., Woodman St., with loss estimated at $75,000, including equipment. It is planned to rebuild.

WATERTOWN—The Hood Rubber Co., manufacturer of automobile tires and other rubber products, has acquired a tract of

about 5 acres of land and buildings adjoining its plant, heretofore held by the Union Carpet Lining Co., located on Arsenal St. The new owner will take early possession and purposes to remodel and improve the existing structures for extensions in its plant.

Michigan

WILLIAMSTON—The Williamston Clay Products Co., recently organized, has plans under way for the construction of a new plant on local site for the manufacture of tile and other burned clay products, estimated to cost about $60,000, including equipment. J. E. and John N. Meyer head the company.

HOUGHTON—The Michigan College of Mines is perfecting plans for the erection of a new metallurgical building at the institution, to be 3-story and basement, 114x155 ft., with two wings, each 2-story. It is expected to call for bids at an early date. Lynn W. Fry, Ann Arbor, Mich., is architect.

GRAND RAPIDS—The Keeler Brass Co. has filed plans and will commence the erection of a new 1-story addition to its plant at 234 Stevens St., estimated to cost about $35,000, including equipment.

Missouri

SPRINGFIELD—The Missouri Rubber Products Co., Inc., recently organized, care of Laurence Schmitt, Colonial Hotel, representative, will commence the immediate erection of a new local plant for the manufacture of automobile tires and mechanical rubber goods. The main unit will be 1-story, 90x285 ft., with a number of smaller structures adjoining, and is estimated to cost in excess of $250,000, including equipment.

BONNE TERRE—The St. Joseph Lead Co., 60 Wall St., has acquired extensive properties in the vicinity of its plant, heretofore held by the Federal Lead Co., a subsidiary of the American Smelting & Refining Co., 120 Broadway, New York, for a stated consideration of $10,000,000. The new owner plans for the extensive development of the property for a large output, and will install equipment for this purpose. It has also contracted with the American Smelting company to handle the ores at its smelting plant near St. Louis, and additions will be made in this works, including the installation of considerable machinery for increase in capacity, estimated to cost in excess of $200,000.

Nebraska

OMAHA—The Balbach Oxygen & Hydrogen Co., South Omaha, manufacturer of industrial oxygen, etc., has awarded a general contract to Peter Kiewits Sons, Inc., Omaha National Bank Bldg., for the erection of a new 1-story and basement plant, estimated to cost about $14,000. J. P. Guth, Paxton Bldg., is architect.

New Jersey

TRENTON—The Resolute Pottery Co., 3rd St., manufacturer of sanitary earthenware, has awarded a general contract to Joseph Hopewell, Trenton, for the erection of a 2-story addition, estimated to cost $15,000.

KEASBEY—Fire, Oct. 21, destroyed a large portion of the plant of the Raritan Hollow Tile Corp., with loss estimated at close to $100,000, including equipment. The building was owned by the General Ceramics Co., and leased to the tile company, of which Robert Lyle is general manager. Rebuilding is as yet undecided.

TRENTON—The Eagle Electric Porcelain Co., Chadwick St., has awarded a general contract to the General Contracting & Construction Co., 17 Emory St., for the erection of a new 1-story plant to cost about $13,000. Work will be placed in progress at once.

Ohio

CANTON—The Wilson Rubber Co. has completed plans and will commence the construction of a new 4-story addition to its plant on Garfield Ave., South, adjoining the present works, estimated to cost about $70,000.

TIFFIN—The Standard Sanitary Mfg. Co., Bessemer Bldg., Pittsburgh, Pa., manufacturer of enameled iron sanitary ware, etc., will take bids at once for the erection of an addition to its plant at Tiffin, to consist of three main buildings, each 1-story, 90x420 ft., and two 90x140 ft., estimated to cost approximately $350,000, including machinery. A new warehouse and office building will also be constructed to cost about $150,000. G. W. Netcher, Tiffin, is architect.

TILTONVILLE—The New Jersey Zinc Co. 160 Front St., New York, has tentative plans under advisement for the erection of a new plant in the vicinity of its present local works, operated in the name of the Prime Western Spelter Co. The new works will consist of a number of units, to be used largely for the production of lithopone and other pigments, and will give employment to about 200 operatives. F. M. Spencer is general manager.

Pennsylvania

PHILADELPHIA—The Bihn & Wolff Co., Ash and Almond Sts., manufacturer of lamp black and kindred products, has awarded a contract to F. Crompson & Brother, 4614 Oakland St., for the erection of a new addition to its plant for increased production, estimated to cost about $35,000. Work will be commenced at once.

HARRISBUEG—The Harrisburg Gas Co. will commence the construction of additions to its artificial gas plant, to include a 1-story compressor and blower house, 1-story boiler house, and 1-story laboratory addition.

South Carolina

CHARLESTON—The Carolina Lime Co., 199 Meeting St., is perfecting plans for the operation of a local plant for the manufacture of fertilizer products. E. H. Hutchinson is vice-president, in charge.

Texas

FORNEY—Fire, Oct. 15, destroyed a portion of the cottonseed oil mill of the Forney Oil Mill Co., with loss estimated at close to $80,000, including equipment and stock. Tentative plans are under consideration for rebuilding.

West Virginia

CHESTER—William Cross, Newell, W. Va., and O. O. Allison and Robert R. Hobbs, both of Chester, are perfecting plans for the erection of a local plant for the manufacture of electrical porcelain products. A tract of 4 acres of land has been secured adjoining the present works of the Davidson Porcelain Co., on the Chester-Newell Road, and ground will soon be broken for the initial plant unit.

Wisconsin

TOMAHAWK—The Tomahawk Kraft Paper Co. will soon break ground for the construction of a new plant unit, to be equipped as a digester building, estimated to cost about $150,000.

New Companies

SPENCER CHEMICAL CORP., New York, N. Y.; chemicals and chemical byproducts; $45,000. Incorporators: R. A. Mayman, W. M. Malisoff and J. E. Mayman, 1054 Park Place, Brooklyn, N. Y. The last noted is representative.

POWELL CHEMICAL CO., Snow Hill, Md.; fertilizers and kindred products; $100,000. Incorporators: William C. Powell and John W. Staton, both of Snow Hill.

MOULTON OIL & REFINING CO., Minneapolis, Minn.; refined petroleum products; $50,000. George F. Moulton, Apartment 310, 2730 Portland Ave., Minneapolis, is the principal incorporator.

P. K. PULVERIZING CO., INC., 6124 Vernon Ave., Chicago, Ill.; paint pigments, paints, and kindred products; 100 shares of stock, no par value. Incorporators: Paul and Walter M. Kalmuk.

BEEKMAN CHEMICAL CORP., New York, N. Y.; chemicals and chemical byproducts; $10,000. Incorporators: W. Wohl, W. M. Malisoff and S. C. Yokelson. Representatives: Caldwell & Polhemus, 50 Church St., New York.

OHIO VALLEY CLAY PRODUCTS CO., Toronto, O.; tile and other ceramic products; $350,000. Incorporators: H. E., D. S., and G. W. Stratton, all of Toronto.

MID-COAST PETROLEUM CO., Oakland, Calif.; refined petroleum products; $200,000. Incorporators: Clarence De Laucey, C. Victor Smith and O. G. Green. Representative: Jesse Robinson, First National Bank Bldg., Oakland.

BUNNY PRODUCTS CO., Port Huron, Mich.; cleaning compounds, chemicals, etc.; $60,000. Incorporators: Charles F. Lohrstorfer, George E. Miller and Fred J. Rowe, 1503 Stone St., Port Huron.

EMPIRE FERTILIZER CO., Baltimore, Md.; fertilizer products; $500,000. Incorporators: William H. Brown, Baltimore; and R. B. Wolfe, Nashville, Tenn. Representative: Thomas K. Parker, Wilmington, Del.

HYGIENIC FIBRE CO., INC., Fall River, Mass.; fiber products; $100,000. Spencer Borden, Jr., is president; and Flint Brayton, Fall River, Mass., treasurer.

GALVANIC CHEMICAL CO., INC., Wilmington, Del.; chemicals and chemical byproducts; $500,000. Representative: Corporation Registry Co., 900 Market St., Wilmington.

MAMMOTH MOLYBDENUM CORP., New York, N. Y.; to operate a metallurgical plant; $150,000. Incorporators: L. L. Wolfe, J. L. Franck and J. H. Fahy. Representative: Briesen & Schrenck, 50 Church St., New York.

L. J. FREBEL SONS CO., Newark, N. J.; leather products; $100,000. Incorporators: Louis J., William L. and Arthur Frebel. Representative: William R. Strickland, 9 Clinton St., Newark.

CROSS REFINING CO., Corsicana, Tex.; refined petroleum products; $60,000. Incorporators: E. E. and C. C. Stewart, and H. H. Cross, all of Corsicana.

J. & S. MFG. CO., Jackson, Mich.; operate a plating works, manufacture plated wares; $30,000. Incorporators: Clifford G. Johnson, George J. Seitz and James P. Will, 448 Seward Ave., Jackson.

TRIANGLE PAPER CO., New York, N. Y.; paper products; $20,000. Incorporators: N. Engel and M. Kazdan. Representative: Konnoson & Konnoson, 170 Broadway, New York.

OX VALLEY OIL CO., Scottsburg, Ind.; petroleum products; $25,000. Incorporators: W. I. Waggoner, Otis Fulmer and William Musselman, all of Scottsburg.

LIBERTY MANGANESE MINE, INC., Oakland, Calif.; to operate manganese and other metal properties; $25,000. Incorporators: Arthur P. Holland, Raymond L. Frick and A. G. Gilson. Representative: Albert H. Elliot, Flatiron Bldg., San Francisco.

ORNAMENTAL HARD PLASTER CO., New York, N. Y.; composition products; $100,000. Incorporators: H. T. J. Fuehman, Brooklyn, N. Y.; Emil Pangel and Allen Glassman, New York. Representative: Martin E. Smith, Wilmington, Del.

ROWE-WILLIAMS, INC., 520 Essex Bldg., Newark, N. J.; stencil papers, etc.; $100,000. Incorporators: Daniel A. Williams, Reuben H. Von Lengerke and Joseph W. Rowe.

BERNARD LABORATORIES, INC., New York, N. Y.; chemicals and chemical byproducts; $10,000. Incorporators: M. F. Weinberg, M. Weinberg, and B. Gross. Representative: A. J. Ewald, 51 Chambers St., New York.

CANTON TIRE MFG. CO., Canton, N. C.; tires and other rubber products; $15,000. Incorporators: W. T. Barker and F. R. Meas, both of Canton.

PLYMOUTH OIL CO., Wilmington, Del.; refined petroleum products; $6,000,000. Representative: Corporation Trust Co. of America, du Pont Bldg., Wilmington.

Industrial Notes

THE BUCKMAN CORP. of Jacksonville, Fla., chemical and industrial engineers, has moved into new quarters at 708 Graham Bldg.

OSCAR GUTTMANN & SONS, 7 Idol Lane, Eastcheap, London, E.C. 3, England, have taken into partnership Gerald Noel White. Dr. White will be responsible for research and laboratory work, and will assist in the general consulting practice and in the technical information service, which they provide in conjunction with representatives and correspondents in all parts of the world.

THE LACLEDE-CHRISTY CLAY PRODUCTS CO. of St. Louis announces that M. G. Babcock, formerly sales representative of Laclede-Christy Co. of Pennsylvania, has succeeded P. M. Offill, resigned, in charge of the Pittsburgh office at 901 Oliver Bldg., Pittsburgh, Pa.

THE SCHAEFFER & BUDENBURG MFG. CO. has changed its name to the American Schaeffer & Budenberg Corp.

Opportunities in the Foreign Trade

Parties interested in any of the following opportunities may obtain all available information from the Bureau of Foreign and Domestic Commerce at Washington or from any district office of the bureau. The number placed after the opportunity must be given for the purpose of identification.

CARBON BLACK, deep black. Hamburg, Germany. Purchase.—8002.

CHEMICALS and extracts for tanning purposes. Sofia, Bulgaria. Agency.—8009.

COPPER SULPHATE, 98-99 per cent., 2 to 3 tons per month. Calcutta, India.—7994.

COTTONSEED OIL. Antofagasta, Chile. Agency.—7999.

SESAME OIL, 20 tons yearly. Vienna, Austria. Purchase and agency.—7997.